VOL. XV. No. 8. AUGUST 1930.

MECCANO MAGAZINE

TRAVELLING 120 MILES AN HOUR

(see page 594)

15¢

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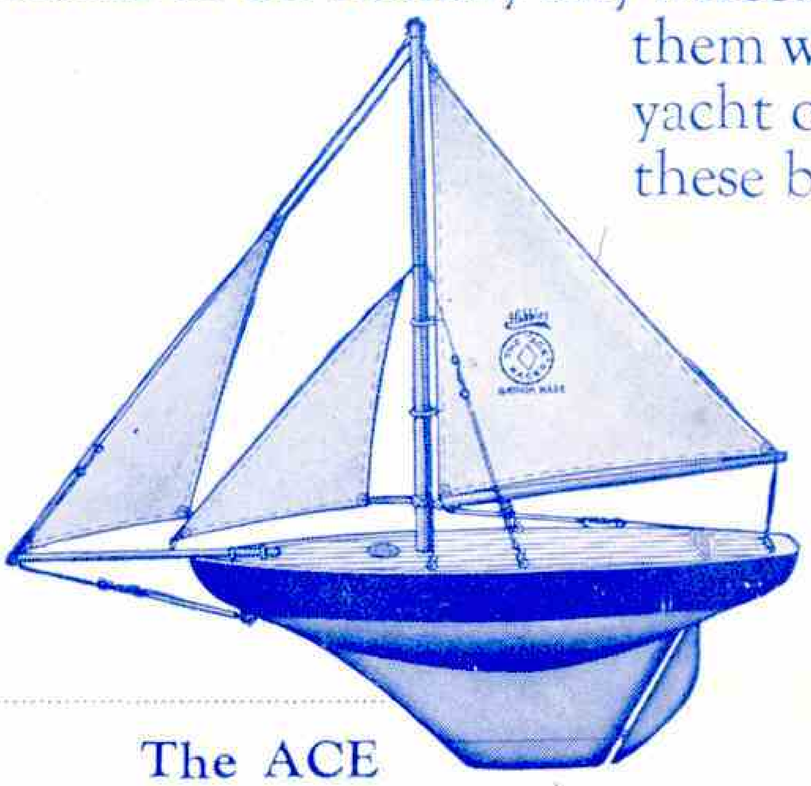
Be sure of your model boat being a good one by asking definitely for a Hobbies. They are unbeatable. At home or on holiday any Meccano boy will find joy with them whether he prefers to sail a yacht or to drive a steam launch these boats are sure to appeal—they are the right price—the best value and guaranteed satisfactory.



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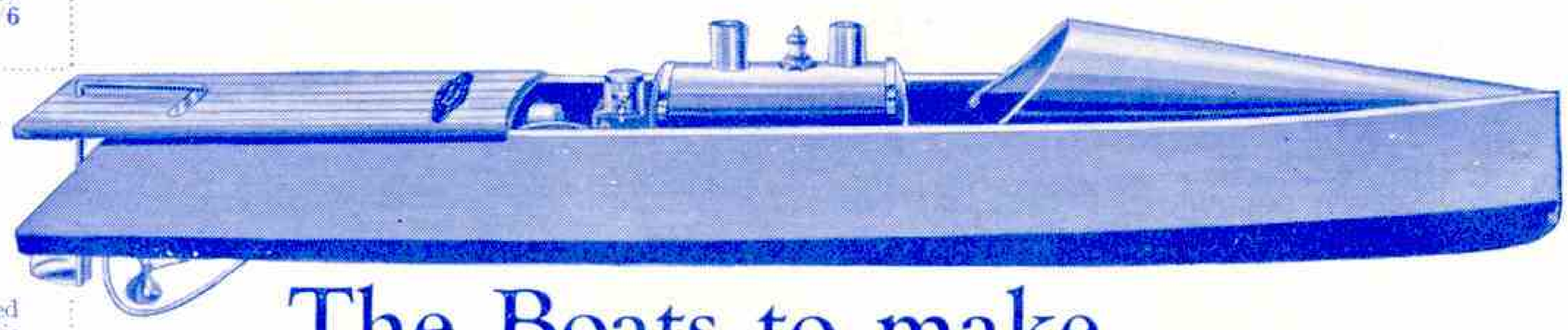

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NEXT MONTH: TELEPHONING FROM A MOVING TRAIN. *PUBLISHED: 1st SEPTEMBER*

MECCANO MAGAZINE

Editorial Office:
Binns Road
Liverpool
England

Vol. XV. No. 8
August, 1930

With the Editor

A Quarter of a Century of Flying

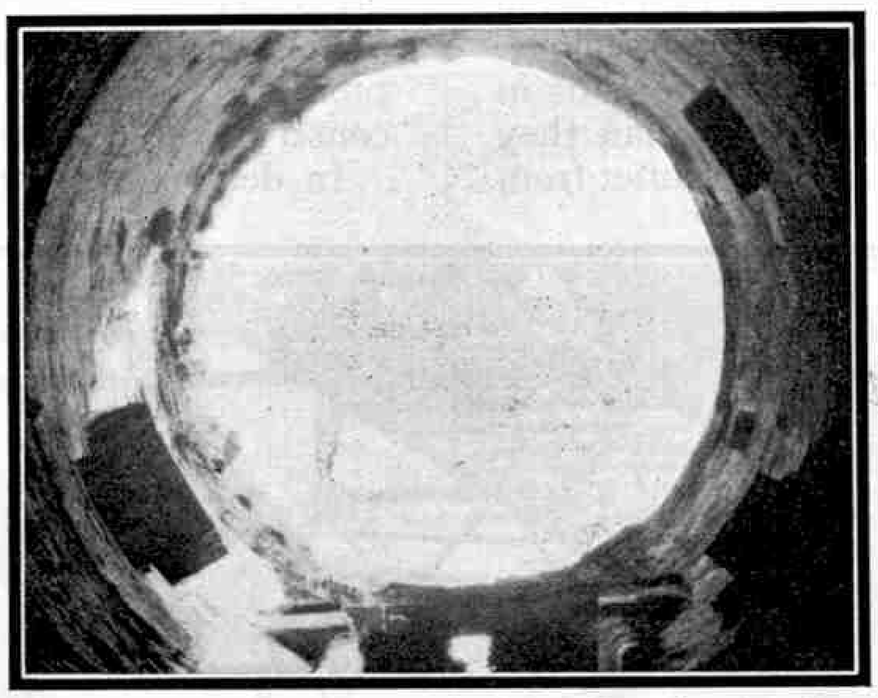
During the last few weeks my post bag has contained many letters from readers who had the good fortune to see the wonderful display given at Hendon on 28th June last by the members of the R.A.F. While reading their glowing accounts of the astonishing aerobatics, parachute descents, formation flying and other remarkable feats in the air, I wondered what would be seen by those who attend the centenary celebrations of aviation, which presumably will be held on 17th December, 2003, at Kitty Hawk, North Carolina, where Orville Wright made the first flight in a heavier-than-air machine. It is impossible to make any prediction, for amazing advances have been made in the first 27 years of flying, and even greater results will follow from the intensive study of aviation that is now being made.

The majority of my readers are too young to remember the time when aeroplanes were sensational novelties, but that was only a little more than 20 years ago and, needless to say, a flying exhibition then was very different from those held to-day. The prospect of seeing the wonderful new machines attracted thousands of spectators, but it must be confessed that the most enthusiastic admirers of the intrepid pilots often found the early meetings somewhat wearisome. No effort could be made to keep to a timetable. Each airman brought out his machine when he thought a flight could be made, and if he and his mechanics were successful in coaxing the engine into performing its work, and nothing more than a gentle breeze was blowing, he took off and made a straight flight a few feet above the ground. A successful turn in the air created a great sensation, and it is safe to say that none of those present ever imagined that the time would come when machines could be flown upside down, and made to execute loops and spinning nose dives.

A comparison of an early flying meeting with the Hendon Display is very instructive. The number of aeroplanes taking part in this year's event was many times greater, and even more striking was the progress in both design and construction as compared with the machines of the pioneers. The amazing advance that has been made in the comparatively short space of 20 years was best shown by the wonderful timekeeping. Visitors did not have to wait until competitors were ready or until the wind had abated. Instead they saw machine after machine take off and go through its evolutions at the appointed time, every event proceeding almost exactly in accordance with a carefully calculated timetable.

Another feature of the display that impressed me very strongly was the wonderful manner in which co-operative flying was carried out. At pioneer meetings there was only room in the air for one machine at a time! At Hendon entire squadrons went up together, and the machines dived and looped in unison, maintaining their correct distances apart throughout their evolutions.

No. 21. WHAT EVER IS IT?



Here is the twenty-first puzzle in the popular series of mystery photographs. Can you identify this mysterious looking object?

To the first reader to send an exact answer or, if nobody is successful in this, to the one who gets nearest, I will send an autographed copy of my book "Wonders of Engineering."

Solutions should be written on postcards only and addressed "Editorial Competition, No. 21, 'Meccano Magazine,' Old Swan, Liverpool." Closing date 30th August.

Liverpool Railway Centenary Pageant

In the June issue I referred to the coming celebrations in Liverpool of the hundredth anniversary of the opening of the Liverpool and Manchester Railway, and I wish again to remind readers of the attractive and unique nature of the programme that is being arranged.

The organisers are not confining their activities to the representation of railway conditions in 1830, but are preparing a pageant that will illustrate almost every important means of travel that has been adopted through the ages. An enormous stage is to be erected in the park—not far from the Meccano Factory—that is to be the scene of the celebrations, and upon this stage will be enacted a wonderful series of historic episodes, with humorous ones introduced here and there to enliven the proceedings. Visitors will see prehistoric cave dwellers, Indian rajahs carried in state upon elephants, Chinese mandarins in palanquins, the covered wagons of North America tracking across the prairie in defiance of hostile Indians, and the stage coaches and highwaymen of our own country. Locomotives of the most modern type will be shown in contrast with the tiny locomotives of the past. An exhibit of particular interest will be the L.N.E.R. "No. 10000," the famous high-pressure locomotive that has aroused so much interest, and which was described in the "*M.M.*" of February last.

The celebrations will commence on the 13th September and will conclude on the 20th. I hope that as many "*M.M.*" readers as possible will come to Liverpool for this unique event and that they will remember to make every effort to visit the Meccano Factory while they are here. I can assure them that they will all be warmly welcomed.

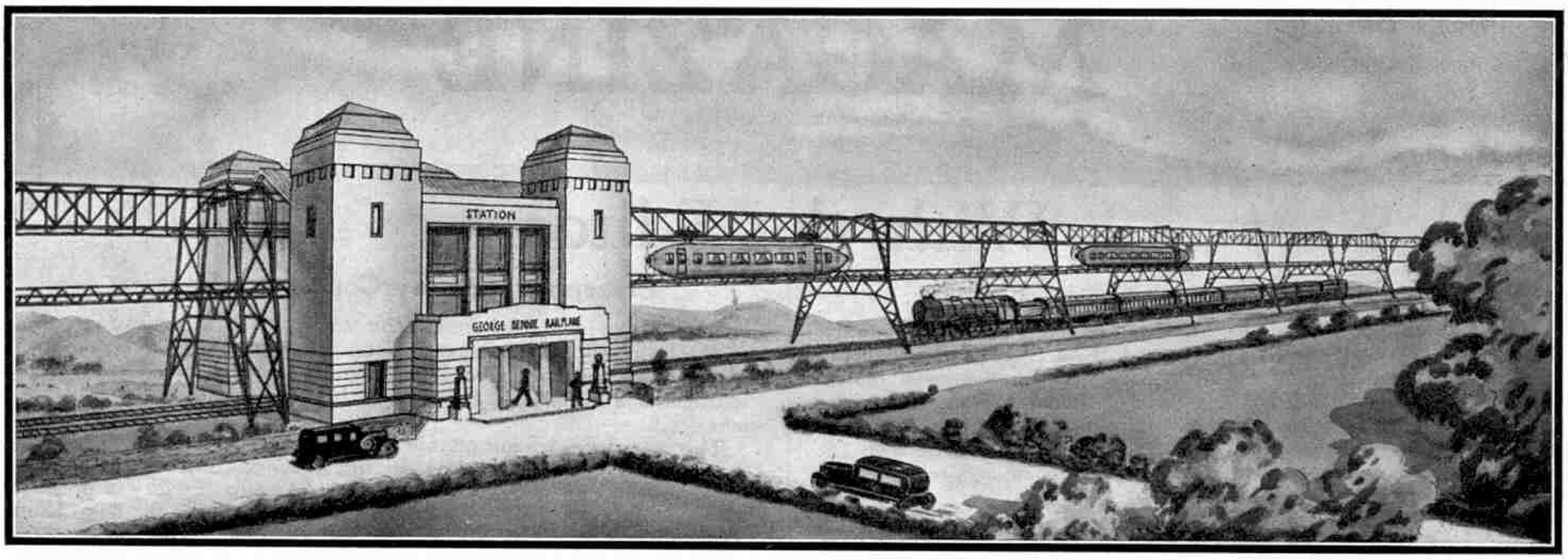
Mystery Photograph No. 20

Once again I must confess that the attempt to puzzle the sharp-eyed readers of the Magazine has almost ended in failure, for less than four per cent. of the competitors who forwarded solutions failed to realise that the July mystery photograph represented a portion of a sponge. Most of those who did not find the correct solution saw in the photograph a piece of coral or pumice stone. Two competitors thought it represented "a magnified piece of cheese" and "a section of an ant hill" respectively, but perhaps the most remarkable suggestion made this month was that of the reader who believed the mysterious object to be hardened snow on which rain had fallen, the lack of whiteness being attributed to accumulated dirt!

The first correct solution to be examined was submitted by A. W. Cartwright, Wall Heath, Nr. Dudley, and an autographed copy of my book "*Wonders of Engineering*" has been forwarded to him.

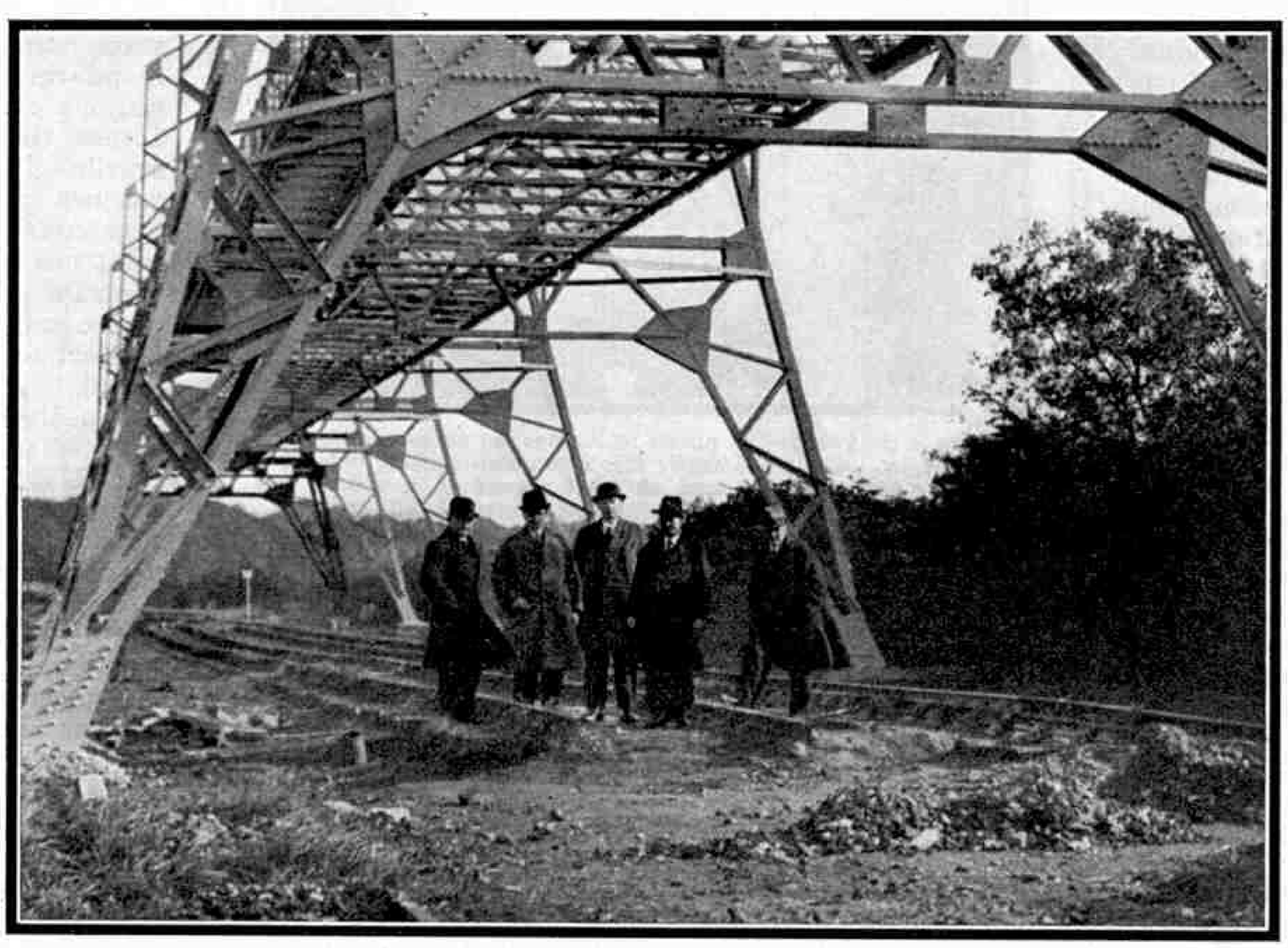
High-Speed Transport by Overhead Railway

The Bennie "Railplane" System



ONE of the greatest problems of the present day is that of finding means of coping with the ever-increasing demand for safe and rapid transport for passengers, mails, newspapers, and perishable goods. The roads in many cases are already carrying more traffic than they are capable of doing with safety, and railways suffer from the disability of having to cope with a mixture of traffic with widely varying requirements in regard to accommodation and speed. Really rapid travel for passengers, and goods that are light and not bulky is, at present confined to air transport. Up to a point this is very successful, but it is attended with uncertainty on account of weather conditions and other factors.

The solution of the problem lies in separating fast traffic from slow traffic, and dealing with it by entirely independent methods. This might be done by providing additional roads or railways for fast traffic only, on the surface, underground, or overhead. Surface construction involves the acquiring of land in a suitable position, which would naturally involve enormous expenditure. Subterranean roads or railways are very costly to construct and involve heavy maintenance expenses for artificial lighting and ventilation, and for the necessary lifts and escalators. Overhead construction offers a much more promising method of dealing with the problem, from the point of view of economy in both construction and maintenance.



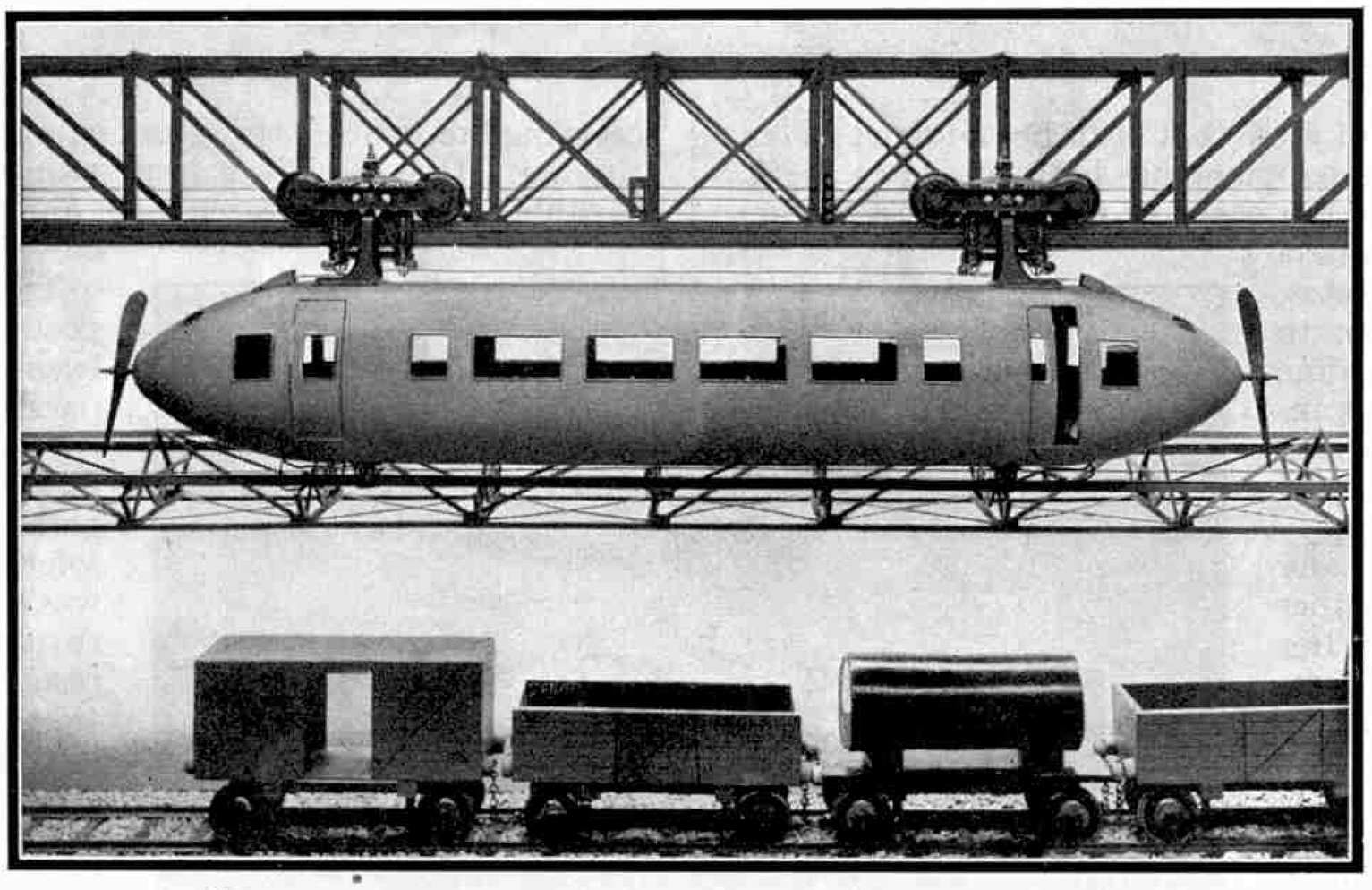
The two illustrations on this page show the test line of the Railplane erected over the track of the London and North Eastern Railway at Milngavie, near Glasgow.
The lower photograph shows a close-up view of a portion of the Overhead structure of the installation. Mr. Bennie, the inventor of the system, is second from the left in the group. We are indebted for our illustrations to the George Bennie Railplane.

In dealing with traffic of the type to which we have referred the first requirement is speed of transport, great haulage power being a secondary consideration on account of the lightness of the traffic. For this reason the construction of overhead railways of the same type as the existing surface railways would involve a great deal of unnecessary expenditure, in addition to failing to provide the necessary speed.

A very interesting system of transport designed to meet these special requirements has been invented and patented by Mr. George Bennie of Glasgow, and is known as the "George Bennie Railplane System of Transport." This system makes use of cars suspended from a rigid overhead structure at the standard bridge clearance in this country of 16 ft. above ground level, and adopts airscrews as the means of propulsion. It combines the safety of ordinary railways with something of the speed of aircraft, and it

offers a reliable and comfortable means of rapid transport independent of atmospheric conditions. It has the further very important advantage of not interfering in any way with existing roads or railways. The system is not intended to offer a substitute for railways, for obviously it is not capable of dealing with heavy and bulky traffic. What it does is to open up wide possibilities for the safe and rapid transport of passengers, mails and light goods.

Owing to the facts that the line is elevated above the ground upon supports occupying only very small areas of land, and that the rolling load due to the car is only from 10 to 12 tons loaded, it follows that the cost of constructing tunnels, deep cuttings, high embankments and bridges is entirely eliminated. The system can be constructed along or across existing roads and railways without any difficulty or interruption, and can be carried over agricultural land without interfering with work to any appreciable extent.

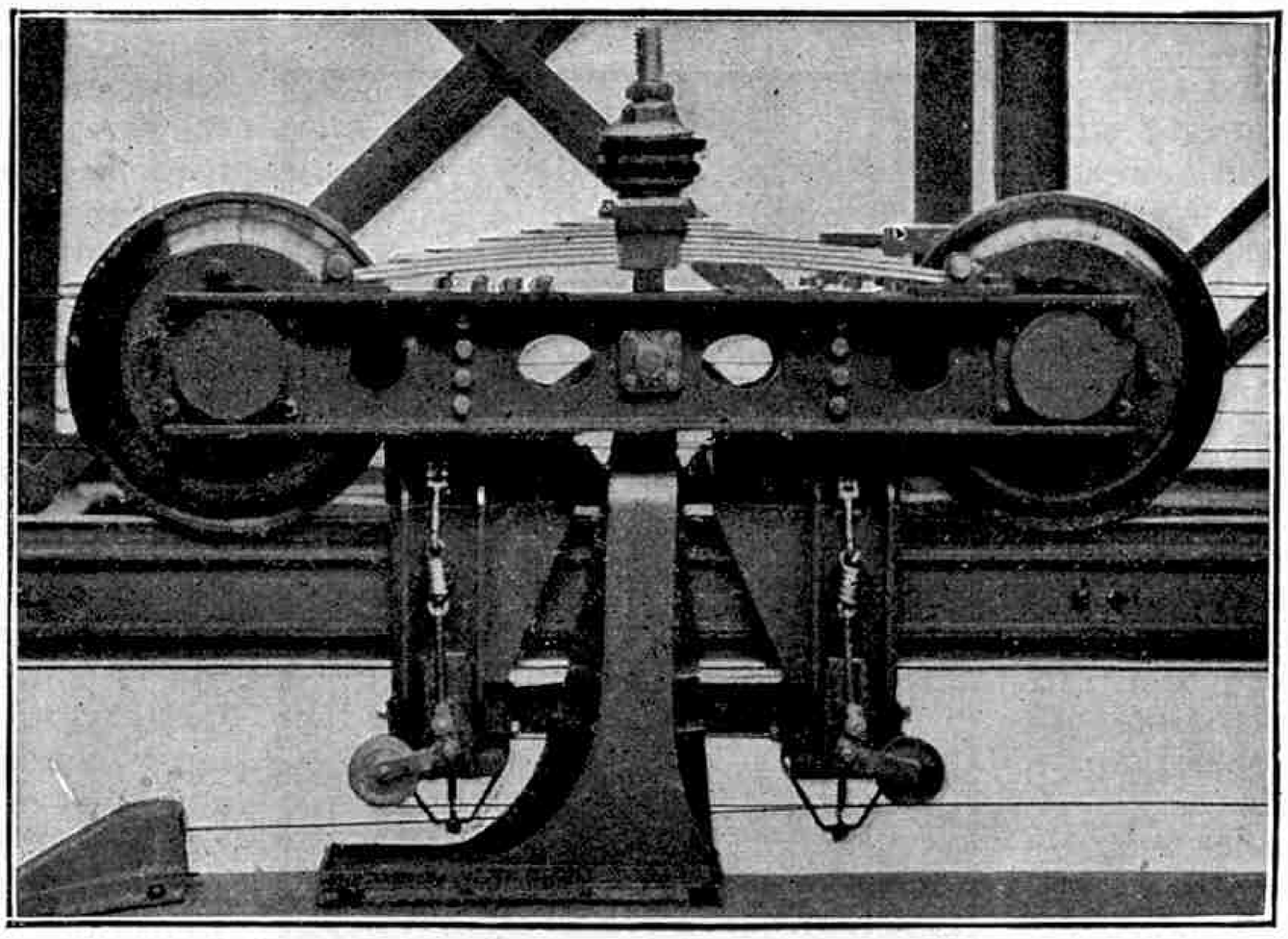


Side view of the Railplane car, showing the method of suspension.

The cars are carried and controlled on an overhead track and propelled by airscrews in a similar manner to airships. By the adoption of a single overhead rail and modern ball and roller bearing devices for all rotating parts, combined with airship lines in car construction, friction is reduced to a minimum. One of the most important points about the Railplane is that it is a non-adhesion drive. The effect of this is to relieve to a very considerable extent the friction that is due to the weight of the car on the suspending rail. The overhead tracks are carried on trestles or columns placed at suitable intervals, and a rigid guide rail is provided beneath the cars to prevent undue swaying of the cars. The design of the bogies is such as to check the tendency of the cars to rise in the air beyond the amount required for relieving the weight on the laminated springs of the bogies.

By adopting the principle of two-point suspension of the cars from bogies having a very small wheelbase, the alignment of the track is capable of following the configuration of the land, thus rendering possible the selection of a route that will reduce construction costs to a minimum and permit of the linking up of towns and villages that lie widely scattered. The undulations of the ground can be followed without any difficulty as the cars are capable of ascending and descending gradients much more severe than those met with on ordinary railways. Many of the engineering problems of ground railways are thus absent. The wheels of the cars themselves run on roller bearings and embody the Bennie patented silent wheel construction, which consists of an annular ring of rubber interposed between the hub casting and the tyre.

Propellers are placed at the front and the rear of the car and are driven by electric motors, the current being collected from a live rail. In cases where electric energy is not available internal combustion engines may be used.



Close-up view of one of the car suspension bogies.

Assuming that the lines were level and that ball and roller bearing devices were used on all rotating parts, Mr. Bennie claims that the friction could be reduced to 5 lb. per ton of load. The total friction to be overcome in moving a car would therefore be 50 lb., to which has to be added air resistance. With an average horsepower of 120 a speed of 120 m.p.h. could be attained on the level. The motors are capable of 100 per cent. overload for a short period, to meet the demands of rising gradients and head winds.

In situations where the surroundings rendered it necessary or advisable, the trestles and the overhead structural work could easily be designed to be in harmony with their surroundings. As a general rule the structural work would be of steel, but if the conditions prevailing or economic considerations called for alternative methods, reinforced concrete, timber, or a combination of the two could be used with satisfactory results. Another point (Continued on page 628)

Fighting the Forest Fire Menace

Ceaseless Campaign by Air and Wireless

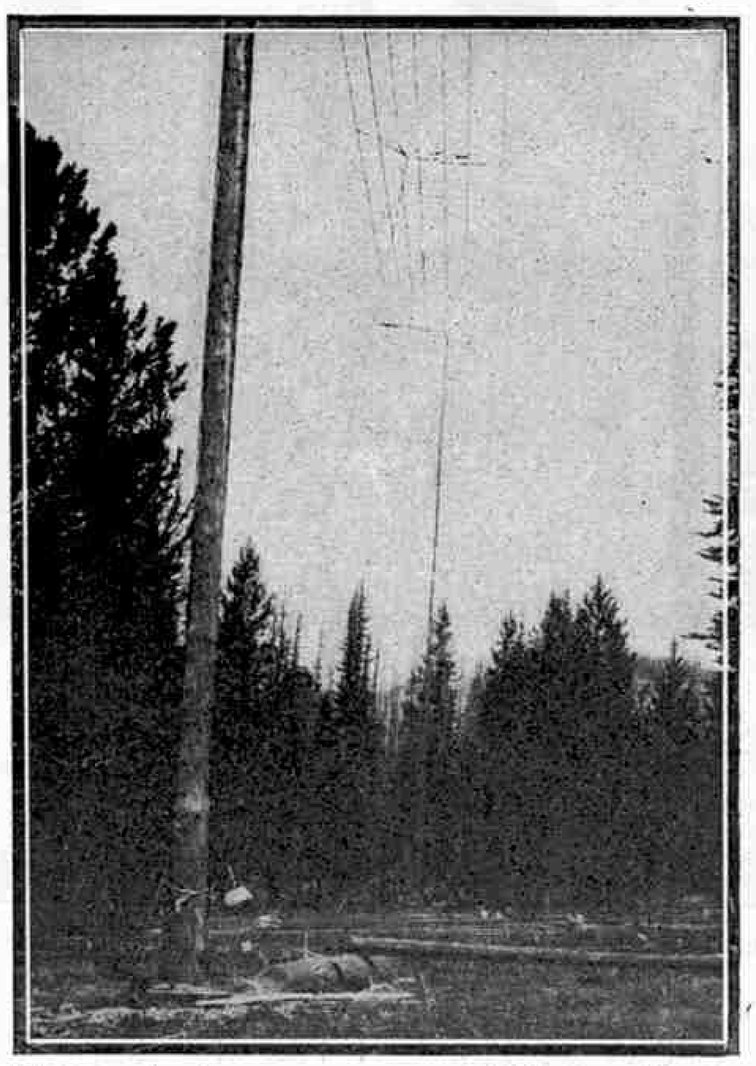
THE wide range of view that is to be obtained by an observer in an aeroplane has been turned to useful purpose during the past few years in the detection of forest fires in Canada and the United States. Such fires are liable to break out at any time during the short but intensely hot American summer and unless they are discovered promptly and dealt with, many acres of valuable timber may be destroyed. Prior to the coming of the aeroplane the detection of forest fires before they had time to assume serious proportions was an extremely difficult matter.

Canada's great timber resources suffer enormous damage every year from forest fires, and quietly but efficiently there is being waged a constant fire-fighting campaign in the air. The timber resources play an extremely important part in the life of the country and therefore every effort is made by the Federal and the Provincial Governments to provide the forests with adequate protection, and already great progress has been made and remarkable results have been achieved in this direction. Formerly a large proportion of forest fires were caused by sheer carelessness on the part of trippers, trappers and others, but so intensive has been the fire-prevention campaign that the majority of fires that now occur are due to natural causes, such as lightning, or to scarcely preventable accident. But whatever their origin fires still continue to occur, and the most elaborate arrangements are made for their prompt detection and extinction.

A pack horse train passing through the forest region.

The aeroplanes in service may be divided roughly into two classes, detection machines and suppression machines. The detection machine is usually an "Avro" or a "Moth," mounted on floats; or a small flying boat of the "*Vedette*" type. These machines are equipped with a light wireless transmitting set that uses either telephonic or telegraphic signals and enables the pilot to keep in touch with his base while on patrol. The suppression machine, as its name implies, is used in carrying fire-fighting crews and equipment to the scene of the fire. It is usually a large twin-engined flying boat capable of carrying a large load, and is of the "*Viking*" or "*Varuna*" type.

The development of protective air service has been made within a comparatively short period. As recently as 1923 matters were still in the experimental stages. Obsolete wartime equipment was being used, operation costs were high, and the results obtained were far from satisfactory. Today, not only are there specially designed aircraft for this work but costs have been materially reduced, and efficiency has been very greatly increased. Last year the basis of fire protection of the northern forest area in Manitoba and Saskatchewan, over 60,000,000 acres was in air operation and an even larger area is protected in the province of Ontario where the provincial government owns and operates its own air service. Experience has shown, however, that the extensive use of aircraft for detection purposes alone is uneconomic; in other words the results obtained do not justify the expenditure involved.



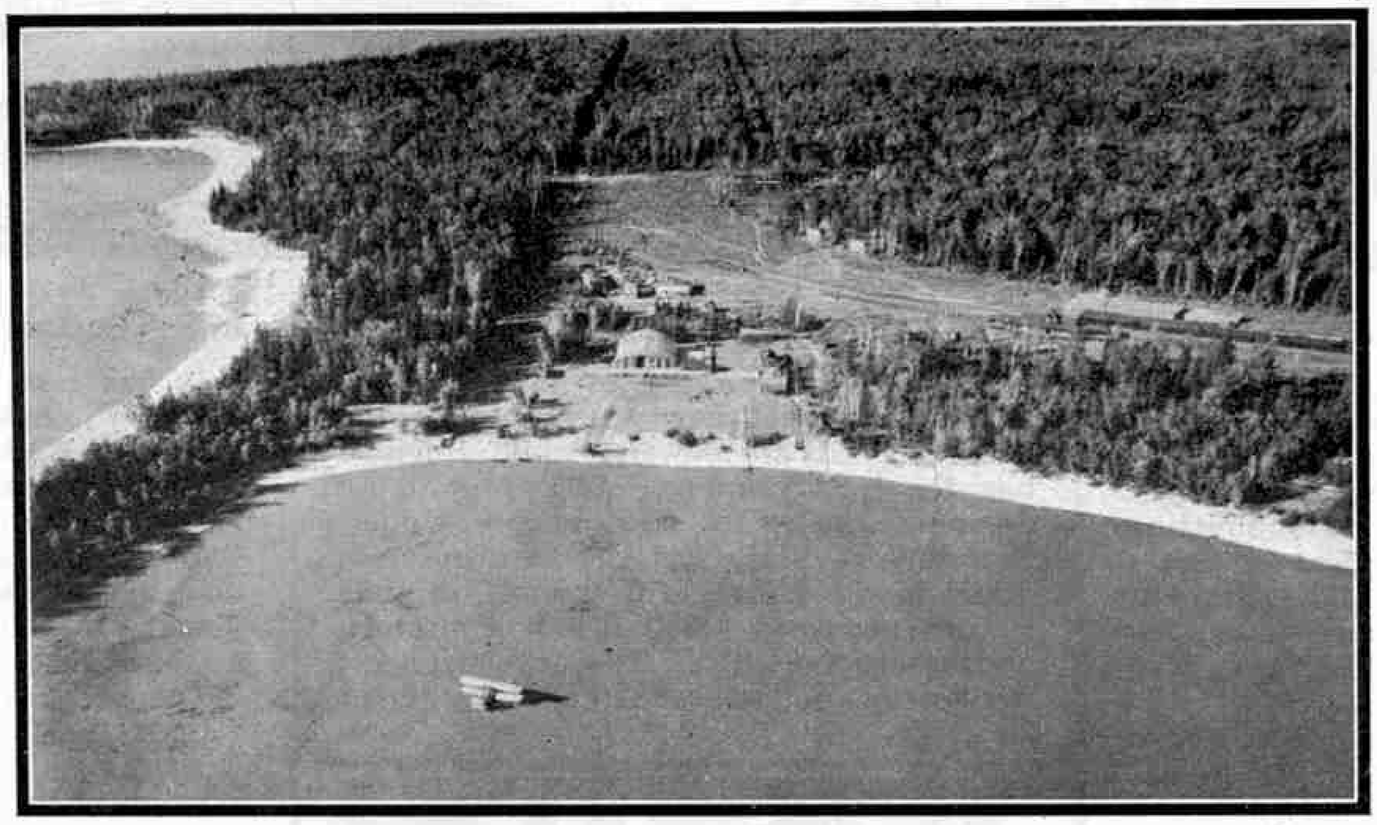
Photos courtesy] [*U.S. Forest Service*

The link with headquarters; a wireless aerial in the wilds.

In the province of Alberta aircraft have been operated for some years in fire-protection work on the eastern slopes of the Rockies. Land machines had of necessity to be used and lack of landing facilities restricted the activities of the machines to the function of detection. When these operations were inaugurated the forest services of the Department of the Interior was faced with the problem of making a large capital expenditure in the installation of look-out stations in this region and before doing so it was decided to experiment with aircraft. Detection patrols have been carried on each season since 1921 and undoubtedly very considerable success has been achieved. At the same time the cost, especially overhead, has been very high and the authorities have now come to the conclusion that detection can be obtained more economically through the use of stationary look-outs with telephone connections to forest headquarters. Look-out facilities are being

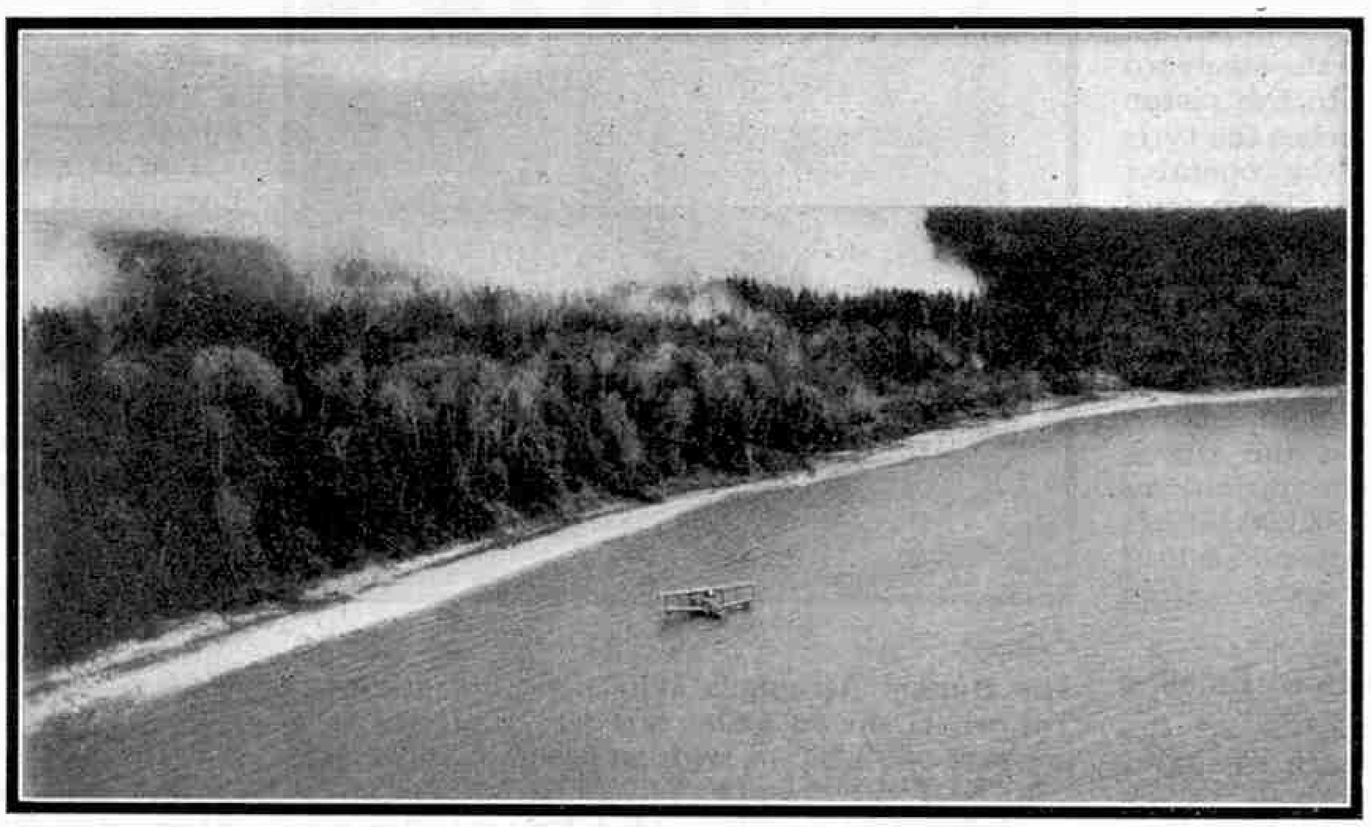
installed and in future aircraft will be used merely as a supplement to the look-out system during periods of high fire hazards when weather conditions are abnormally bad ; and for scouting purposes, transportation of fire-foremen, etc., in connection with fire fighting.

Where air-operation costs can be spread over suppression activities also, as is the case in the northern forest regions, the operations become financially feasible. Further, these northern areas present almost insuperable difficulties with regard to protection by any other means. Communication is lacking ; all transportation must be by waterways, involving the use of canoes and frequent portaging ; few settlements exist and in consequence no labour supply is available. For these reasons any method of protection other than by the use of aircraft is defective, and is in fact reduced largely to the moral effect of patrols or travellers who encounter them during their travels.



The air station at Victoria Beach, Manitoba.

These northern forests which consist largely of spruce form the foundation of Canada's pulp and paper industry. Their importance and their value increase yearly, and their destruction by fire would be nothing less than a calamity to the Dominion. The coming of aircraft has provided an instrument for effective protection at costs justified by the values involved. The fact that these costs are low is due in large part to the presence of look-outs throughout the forest regions. About one third of the total area is taken up by look-outs and rivers that provide natural landing grounds for hydro-aircraft thus not only ensuring safety of operations but also enabling approach to within a very short distance of any fire that may break out.



Photos courtesy] [*High Commissioner for Canada*

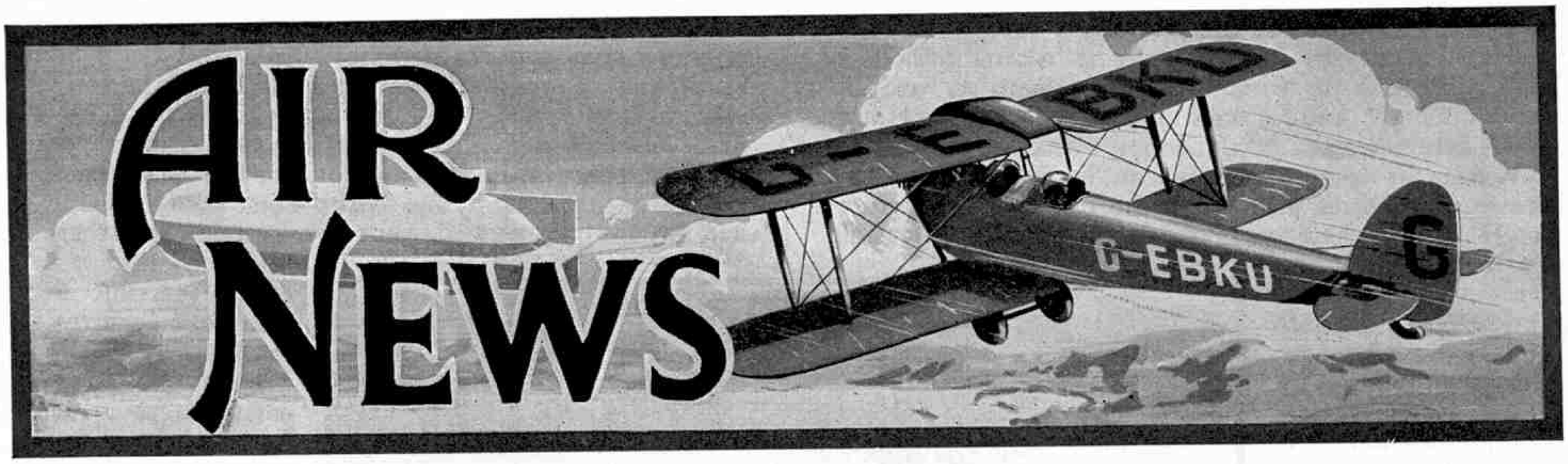
Tackling a forest fire. Suppression aircraft landing at Lake Winnipeg, Manitoba.

So general is the appreciation among people in Canada of the value of their forests that many organisations contribute to their protection in various ways. Not the least interesting is the practice of the Canadian Pacific Railway of patrolling its right of way in forested areas with the express purpose of watching for outbreaks of fire. Men are specially detailed for this service ; tank cars, steam pumps, and supplies of hose are held in readiness at strategical points, and prompt measures generally are taken to combat all fires that are within reach.

When wireless came to be a reliable means of communication it was realised in Canada and the United States that it provided great possibilities for the specialised work of forest watching. It was not long before observation posts in isolated positions were equipped with wireless apparatus in order to provide a thorough test, and these were immediately successful. Since then the value of wireless has been proved over and over again, and there is no doubt that many of the terrible fires that have occurred in the past could have been checked in their early stages if wireless had been available. For instance on one occasion a fire broke out in the Clearwater National Forest in the United States and extended rapidly. The trees from which the telephone line was suspended were burnt down, the wire was melted by the intense heat and ultimately a stretch of line extending over more than 90 miles was put out of action. This fire would have been much less disastrous if a prompt warning by wireless could have been transmitted to Headquarters.

The equipping of the observation posts with wireless was a difficult matter on account of the fact that they were usually situated on high and rough ground. When the United States Forest Service set out to equip their post at Beaver Ridge in Idaho, the wireless apparatus had to be drawn across a mountain range over an almost impassable trail of 30 miles. As may be imagined, the conveying of delicate instruments under such conditions provided an extremely serious problem. A great deal of trouble was experienced in transporting the cumbersome battery. Three times the battery was lost or destroyed in transit owing to packhorses slipping off the trail and packs becoming detached and rolling down the mountain side to destruction. Eventually a fourth attempt proved successful and the equipment was safely delivered.

On one occasion the wireless operators at this particular post had a very exciting experience. A serious forest fire broke out and spread with such alarming rapidity that the post was rapidly becoming completely surrounded by a ring of fire. It looked as though it was threatened with destruction and the operators determined to abandon it, but to make an attempt to save the wireless apparatus. Hurriedly this (*Continued on page 628*)



Testing Dunlop Aeroplane Wheels

The illustration that appears on this page shows a huge aeroplane wheel testing machine that is in service at the Fort Dunlop works of the Dunlop Rubber Company. This is capable of submitting an aeroplane wheel to vertical pressures up to a little more than 100,000 lb., or nearly 45 tons. It is claimed to be the largest machine ever made for the special purpose of testing aircraft wheels.

The machine is 14 ft. in height above the ground, while below there is an excavation 7 ft. in depth, 9 ft. in width, and 11 ft. in length. It is operated by hydraulic pressure from a main supply at 1,500 lb. per sq. in., and this is fed to a piston, 10 in. in diameter, that is connected to a table at the bottom of the machine. The pressure applied is measured by balancing it against the weight shown near the handle on the steelyard on the right of the machine, a system of levers being interposed between the table lifting cylinder and the end of the steelyard.

A wheel that is to be tested is secured on a bearing above the weighing table of the machine. With the machine in perfect balance, the handwheel below the steelyard is turned to admit pressure to the piston and raise the table until it touches the tyre. As the pressure increases, the operator winds the weight along the beam and keeps the steelyard in balance.

The operation is continued until so much pressure is put on the wheel that it collapses—usually with a loud report. The position of the weight on the scale on the steelyard is then recorded and this shows what load has been put on the wheel.

The wheel shown in the illustration was subjected to a pressure of 93,200 lb. It did not collapse under this tremendous load and when taken down for examination showed no sign of distortion.

Aerodrome on Roof of American Building

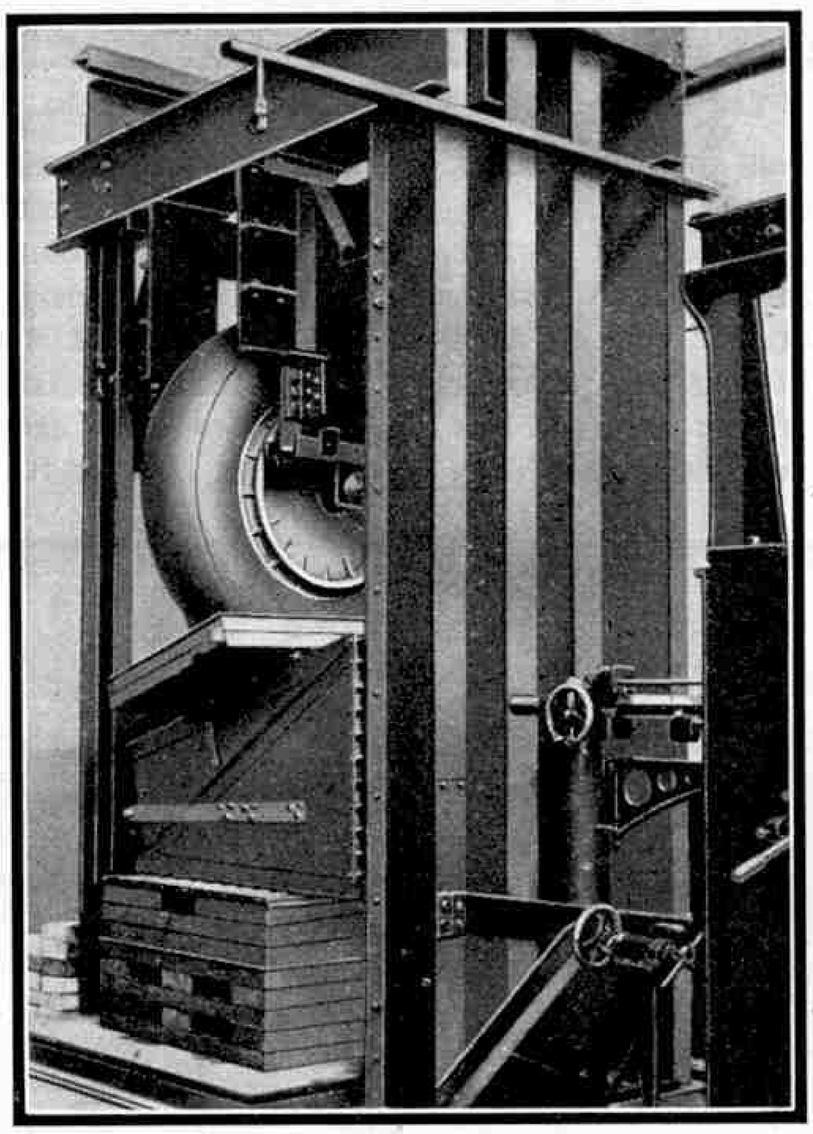
In "*Air News*" of the issue of the "*M.M.*" for March, 1930, we stated that a mooring mast for airships was to be constructed on top of a skyscraper in New York City. The purpose of this is to enable passengers by air to alight in the heart of the city instead of in outlying districts. An even more remarkable experiment of this kind is to be made at Los Angeles, California. There plans are now being prepared for a huge building, the roof of which will be used for an aerodrome.

The actual top of the building is expected to measure 980 ft. in length and 152 ft. in width, but in order to increase the size of the novel aerodrome, small auxiliary platforms projecting over the sides are to be constructed. This will give a landing space 1,200 ft. in length by 200 ft. in width.

The World's Military Aircraft

To-day France possesses more first-line fighting aircraft than any other of the world's great air powers, while England has the least number. According to an answer given by Mr. F. Montague, Under-Secretary of State for Air, to a question asked in the House of Commons, in 1925 France possessed 1,280 first-line aircraft, and now owns 1,310. The next strongest Air Force is that of Italy. The Government of this country has added 500 aeroplanes to its Air Force since 1925, making a total of 1,100 machines. Third place is occupied by the United States, the strength of whose first-line aircraft force has risen from 750 machines in 1925 to 950 this year. England had 630 aircraft in 1925, and to-day has only 150 more.

During the present year France is to increase the number of military aircraft she possesses by 48 machines. In the United States four new squadrons are being formed, but these will only require 24 additional aircraft, while Great Britain is adding only two squadrons, each of which will consist of eight machines.



Courtesy [*Dunlop Rubber Co. Ltd.*

The Dunlop Aeroplane Wheel Testing machine. The wheel shown under test was subjected to a pressure of 93,200 lb. without becoming distorted.

British Engines for Swedish Military Aircraft

It has been announced that two new Swedish single-seater fighters, one a Fokker D.XVI, and the other a Svenska "Jaktfalk," are fitted with Armstrong Siddeley supercharged "Jaguar" engines. The news is a reminder of the notable tendency to instal British aero engines in foreign machines, particularly in those intended for military service.

The single-seater fighter biplane of the "Jaktfalk" type built by the Svenska Aero A.B. of Stockholm is an interesting example of this tendency. It is fitted with a 500 h.p. Armstrong Siddeley geared "Jaguar" engine. When fitted with a supercharger, and carrying a useful load of about 1,100 lb., the aeroplane has a speed of 199 m.p.h. at an altitude of 12,725 ft. Its initial climb to 16,450 ft. is completed in nine minutes, while the maximum ceiling is 31,170 ft. The landing speed of the machine is about 56 m.p.h., and it pulls up in a distance of about 153 yards.

The wing span of the "Jaktfalk" is 29.5 ft., and it is 23.3 ft. in length. The wing area is 237 sq. ft. The machine weighs 1,929 lb. when empty, and carries a useful load of 1,102.5 lb., making the all-up weight 3,031.5 lb.

The aeroplane is fitted with all necessary instruments, military equipment, and two fixed guns firing through the airscrew. It has good flying qualities, and is capable of all kinds of aerobatics. It is constructed mainly of steel, the fuselage consisting of welded steel tubes with a covering of fabric. The wing spars are built up of rectangular steel tubes, the ribs being of wood, or steel, while the covering is of fabric.

Kingsford-Smith Crosses Atlantic

A short time ago a successful trans-Atlantic flight was made by Mr. Kingsford-Smith, the well-known Australian airman, in his famous Fokker machine the "*Southern Cross*," fitted with three Wright "Whirlwind" engines. Mr. Kingsford-Smith, who was accompanied by three others, started the flight from Portmarnock Strand, near Dublin, and landed at Harbour Grace, Conception Bay, Newfoundland, 31½ hours later.

The "*Southern Cross*" afterwards was flown to New York where the aviators were given a rousing reception. Mr. Kingsford-Smith later flew across the American continent to the Pacific Coast, in order to complete his flight round the world, which was commenced on 31st May, 1928. Thus he now shares the distinction of having flown round the world with the U.S. Army airmen who carried out a world flight in 1924, and the crew of the "*Graf Zeppelin*" which circumnavigated the globe in 1929.

Electric Beacons to light Air Routes

On page 602 of this issue of the "*M.M.*" appears an article describing the rotating beacons that are used to light up the extensive airways in the United States. In certain instances the contour of the ground makes it impossible to utilise these. Thus on the side of a hill the beam of an ordinary beacon often would be obscured from view, since for a great part of the time it is in operation it cannot be directed into the hillside.

In order to deal with extraordinary situations of this kind the General Electric Company of New York has introduced an electric code beacon that flashes a distinctive warning in all directions. An illustration of it appears on this page. Its flash is not as powerful as the beam of a rotating beacon, but it is economical and reliable in action.

Other interesting uses also have been suggested for it. One of these is the marking of obstructions that may be dangerous to pilots. Beacons employed for this purpose are fitted with red shades. Eight units with red shades already have been installed on the new Suisan Bay Bridge of the Southern Pacific Railroad, and three have been mounted on top of huge voltage transmission towers of the New York Power and Light Corporation. Units that show green lights are proposed for use as auxiliary air port beacons.

For installation on airways and for marking obstructions, the beacon is equipped with two 200-watt, 110-volt Mazda lamps. For airport installation two 500-watt Mazda lamps are required. The upper lamp is used base up; the lower lamp base down. Means of adjusting the focal position of the lamps with respect to the lenses is provided.

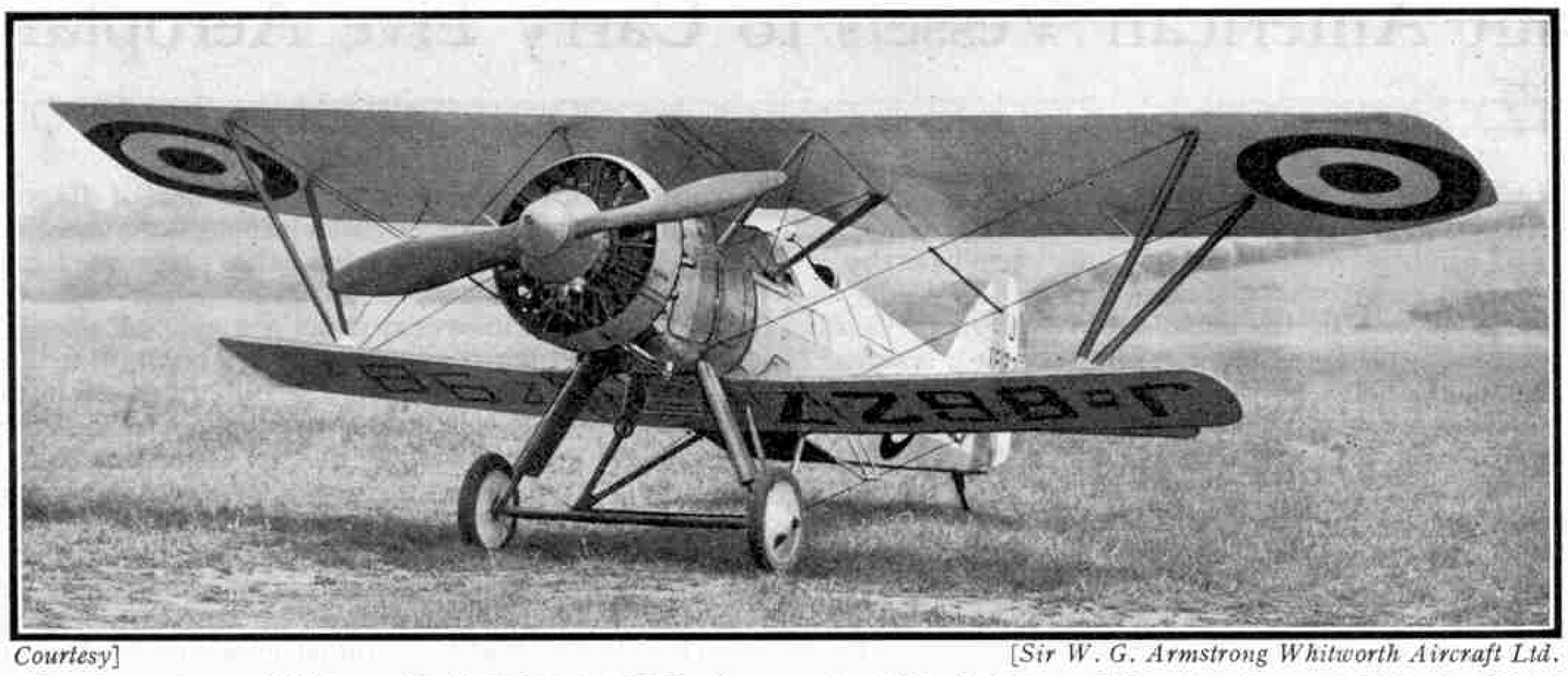
Dornier "*DO.X*" for Atlantic Crossing

The builders of the huge Dornier "*DO.X*" flying boat, the Dornier Metallbauten G.m.b.H., of Freidrichshafen, have announced their intention of attempting an Atlantic flight with the machine, and probably the effort will be made during this month. The starting point is expected to be either Lisbon or Cadiz, and the flight will be made by way of the Azores, Hamilton, Bermuda, and New York. The exact number of persons who will make the journey is not yet known, but it is expected that they will include Mr. Maurice Dornier, who will represent his brother, who designed and constructed the machine, and five selected passengers in addition to the crew of ten.

Readers will remember that a full description of the Dornier "*DO.X*" was given on page 922 of the December, 1929, issue of the "*Meccano Magazine*." The all-up weight of the giant machine is about 35 tons, and it is fitted with twelve "Jupiter" engines developing 6,300 h.p.

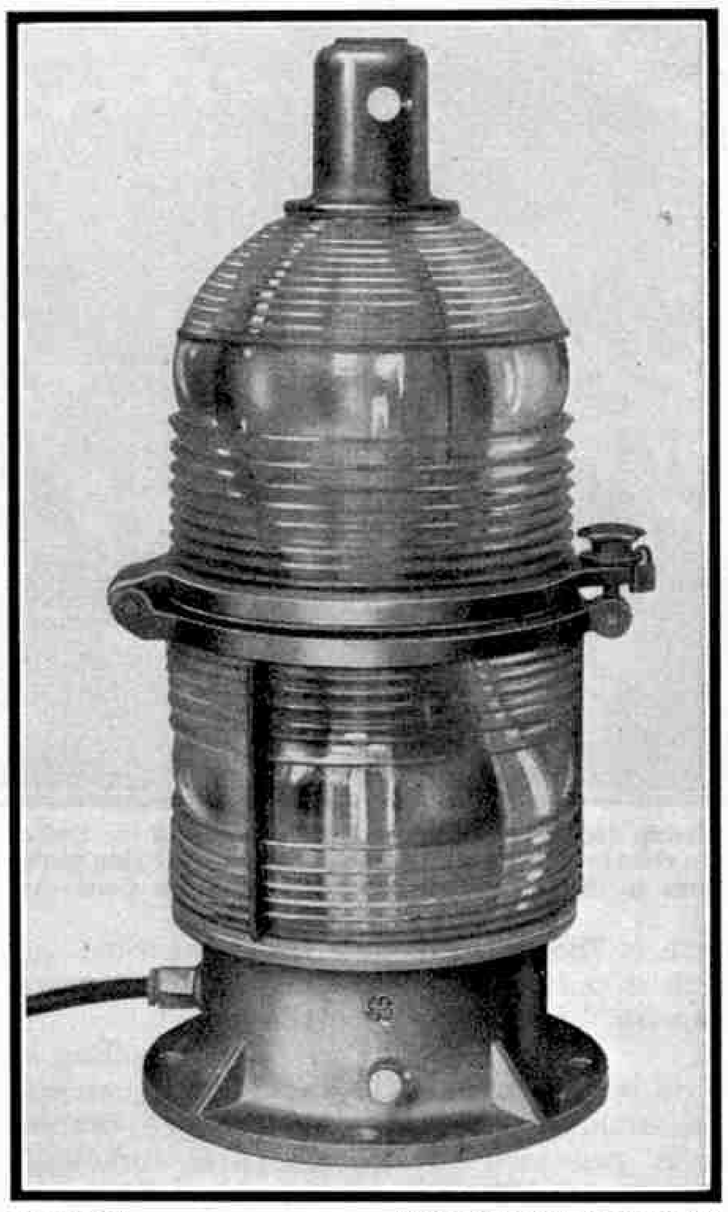
New Light Seaplane Records

In the single-seater light seaplane class three world's records have been set up by a Junkers "Junior" machine fitted with an Armstrong Siddeley "Genet" engine. The records, which have not yet been homologated by the F.A.I., are the endurance record, which is claimed with 16 hrs. 28 min.; the distance record in a closed circuit, with 1,312.5 miles; and the speed record over 100 km., with 103 m.p.h.



Courtesy [*Sir W. G. Armstrong Whitworth Aircraft Ltd.*

The Armstrong Whitworth "Siskin" IIIB day and night fighter. This machine, which is fitted with a "Jaguar" engine, has been developed from the "Siskin" IIIA, a single-seater fighter largely used in the R.A.F. It has a maximum speed of 164 m.p.h. at an altitude of 15,000 ft.



Courtesy [*International Electric Co.*

The electric beacon described on this page.

The fuel used was a mixture of equal proportions of benzol and petrol, and the Junkers Company state that during the flight the total consumption of fuel amounted to 3.32 gallons per hour. In the record for distance in a closed circuit, the average speed was 81.8 m.p.h. The oil consumption was very low, working out at 1.3 pints per hour.

Landing Aircraft in Fog

The airman's greatest enemy is fog, and from time to time experiments have been carried out in efforts to discover means of enabling a pilot to fly in perfect safety when foggy weather is experienced. In the case of British commercial machines it may almost be said that the problem of safety in fog has been solved for machines in actual flight to and from Croydon Aerodrome. The pilots of these keep in touch with the aerodrome itself by wireless and warnings may be issued to aircraft that are flying dangerously near each other.

Landing on a fog covered aerodrome brings with it new dangers and many suggestions have been advanced to enable this to be done in safety. In recent experiments devices for this purpose have been tested by a pilot of the Royal Air Force, who was accompanied by a member of the scientific staff of the Air Ministry as a passenger. The machine—a standard "Avro" aeroplane—made five successful landings at Farnborough through a fog that rose to a height of 90 feet above the ground. Conditions were so bad that once the aeroplane had disappeared from view on taking off, it was not seen again until it taxied up to the hangars after landing.

In order to guide the pilot who carried out the tests a small balloon was tethered 400 feet above the ground and about half a mile from the aerodrome. On the dashboard of his machine was mounted a pitch and yaw indicator, and a weight suspended a few feet below the landing carriage of the machine completed the apparatus.

The balloon was in clear air above the bank of fog, and as the pilot knew its position relative to the aerodrome he was able to use it as a guide post showing him the direction of the landing ground. Gliding past the balloon at the desired angle—this was indicated by the pitch and yaw indicator—the airman landed without difficulty, the suspended weight telling him when he was about to touch the ground by causing a red lamp on the dashboard to light up when it made contact.

These trials show that the difficulty of landing in fog may be overcome by very simple means, and it is expected that great practical use will be made of the method adopted in them.

World's Record Endurance Flight

Two American aviators recently have set up a new world's refuelled endurance record of 533 hours 40 min., or just over three weeks. The record beats the previous one by 113 hrs. 19 min. The two men were brothers, and it is stated that they will receive about £40,000 for their record-breaking flight.

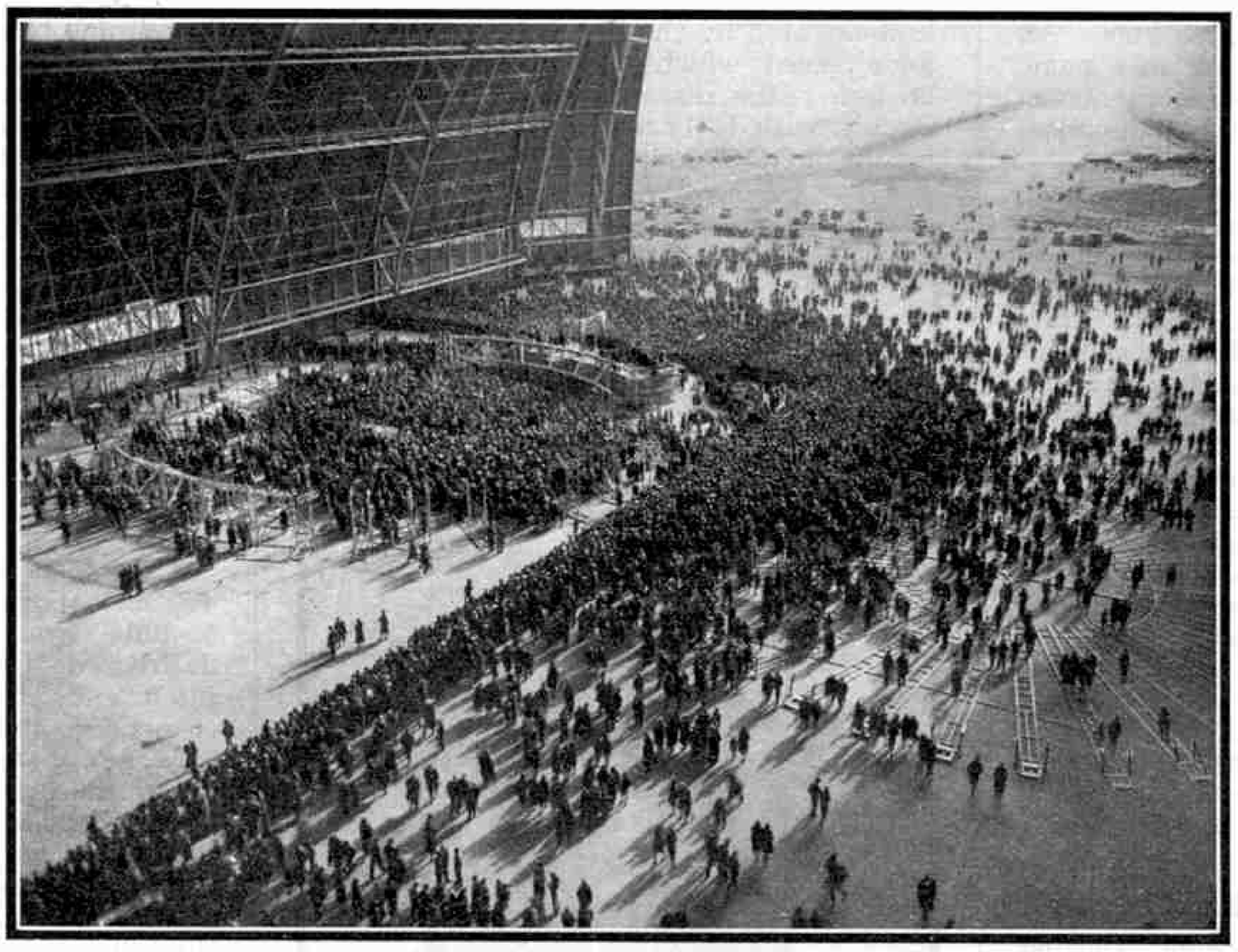
Building the World's Largest Airships

Giant American Vessels to Carry Five Aeroplanes

THE success of the "*Graf Zeppelin*" in crossing the Atlantic Ocean on several occasions, and in flying round the world, showed that rigid airships may be reliable and trustworthy, even in bad weather, and the satisfactory trial flights of "*R100*" and "*R101*," the much larger British vessels, have given further proof that as a means of air transport the airship may be a serious competitor of the aeroplane.

The two British airships are wonderful vessels and undoubtedly represent a great advance in type on the "*Graf Zeppelin*." At present they are the two largest airships in the world, each having a capacity of 5,000,000 c. ft. Shortly an additional cell is to be added to the "*R101*," and this, with other changes, will bring her capacity up to 5,630,000 c. ft. She will then rank as the largest vessel of her kind yet constructed. But that record will be lost to this country next year, for in America two vessels with envelopes holding as much as 6,500,000 c. ft. of gas are being built for the United States Navy at Akron, Ohio, by the Goodyear-Zeppelin Corporation. An enormous shed, or "dock," as the Americans say, has been built to hold these airships, and within it work on their construction has been carried on since the contracts were awarded to the Corporation in October, 1928. The two are sister vessels and are known as "*ZRS-4*" and "*ZRS-5*." The former will be ready first. It is expected that it will be completed in April, 1931.

When complete the "*ZRS-4*" will appear to be shorter and wider than earlier airships of the Zeppelin type. In shape these resembled lead pencils, for in comparison with their length they were narrow, a feature that to a certain extent is repeated in the "*Graf Zeppelin*," the latest product of the famous German airship building company. Although the latter vessel has a capacity very little more than half that of the "*ZRS-4*," it is only 9 ft. less in length, but the American airship is greater in width by nearly 33 ft. Her total length is 785 ft. and her maximum diameter 132.9 ft. Thus her length is only about six times her width, while that of the "*Graf Zeppelin*" is nearly eight times the greatest diameter of the vessel.



A view in the enormous airship dock when Admiral Moffett, Chief of the United States Naval Bureau of Aeronautics, drove a golden rivet into the main section of the monster ring girder of "ZRS-4." For this and the other illustrations to this article we are indebted to the Goodyear-Zeppelin Corporation.

The construction of the hull of the "*ZRS-4*" is being carried out on the triple layer principle characteristic of airships of the Zeppelin type. A rigid duralumin framework is provided in order to withstand the stresses from the loads carried. Within this are a number of gas cells, that supply the necessary lifting power, and over all is a taut fabric outer cover that is doped and metallised in order to make it waterproof.

The cover not only offers protection against the elements, but also enables the builders to give the airship a smooth flying surface, a great necessity if high speeds are to be attained. In addition, its metallised surface reflects rather than absorbs the sun's rays, and thus prevents the temperature within the airship from becoming too high and causing the lifting gas to expand unduly.

The framework of the vessel is of a very interesting type. It consists of transverse ring girders, spaced at intervals along the length of the ship, and connected by long girders that extend from the nose to the tail. A network of diagonal wires is used in order to brace the outside panels, and another system of wires and cord nettings transfers the pressure from the gas cells to the framework.

The main transverse rings are spaced about 74 ft. apart. The girders of which they are built are triangular in shape and actually form corridors along which members of the crew may climb completely round the circumference of the ship when it is necessary to make inspections or to carry out repairs. The long girders running from nose to tail also are triangular in cross-section. There are three of them, one extending along the top centre of the vessel and the others being placed symmetrically in the lower part. These also are corridors or gangways for the use of members of the crew, and, in conjunction with those in the ring girders give access during flight to almost every part of the vessel.

The employment of an extensive system of corridors and gangways is a distinct novelty and a great advance on the practice followed in building previous airships. In most of these only a single corridor along the bottom of the ship was provided, in addition to a "cat walk" running from front to rear. The crews of the new airship will be able to move about almost as freely as the men in charge of a giant ocean liner, for in addition to those already mentioned, there are a number of other gangways leading to the engine rooms and other sections of the vessel.

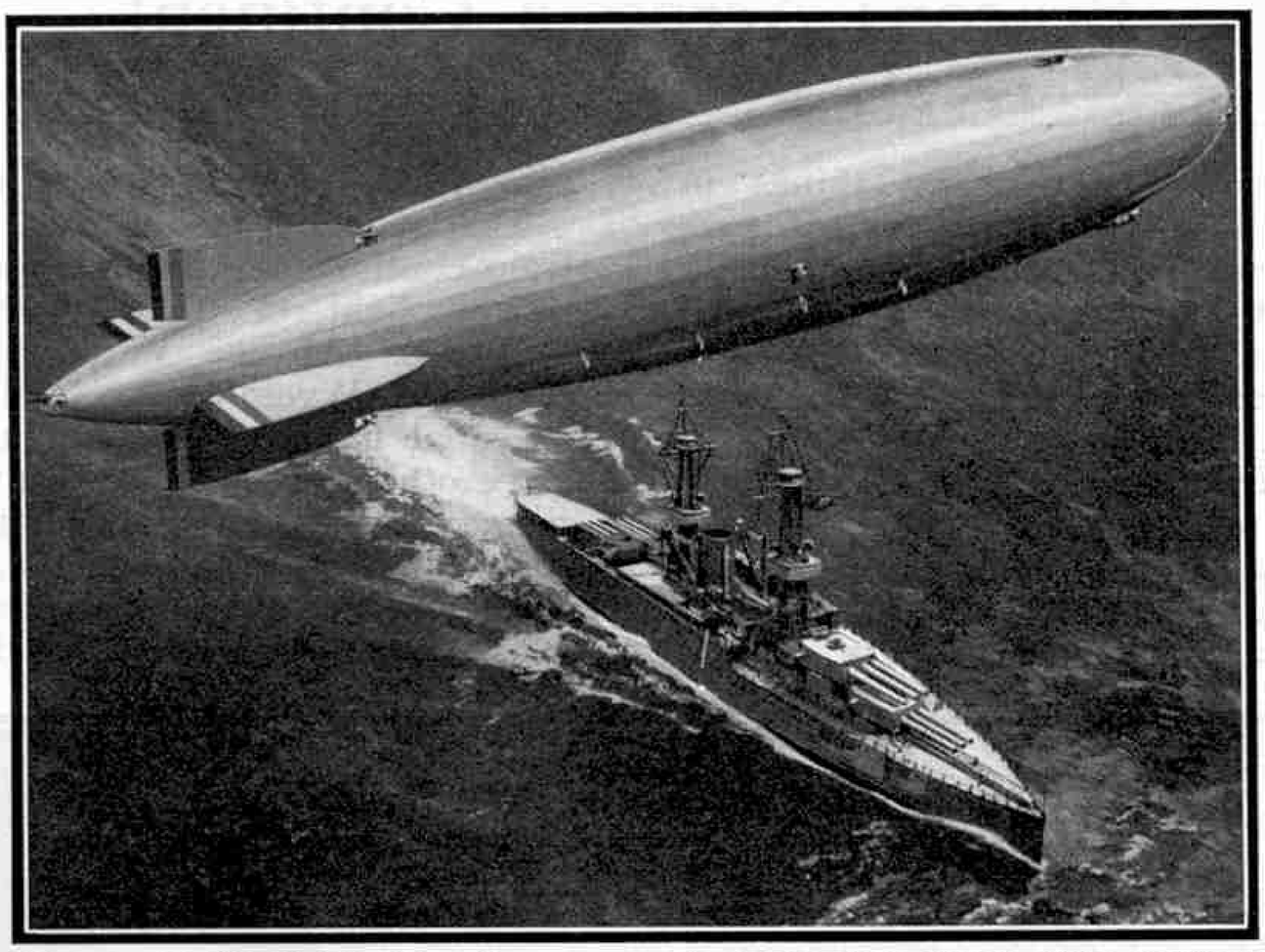
The number of gas bags within the American airship is 12. They form a bulkhead system similar to that employed in ocean-going vessels, and a loss of buoyancy due to the destruction of two whole compartments, and the escape of the gas they contained, would not seriously endanger the craft, although of course, its lifting power would be correspondingly reduced. By making use of dynamic lift—that is, by flying the vessel at a slight upward angle—compensation may be obtained for the loss of even more gas than would follow the rupture of two of the cells.

In controlling a giant airship one of the dangers to be guarded against is caused by changes of temperature within the cells. If the gas becomes too warm its pressure rises, and this may increase sufficiently to cause damage to the containing fabric. In the "*ZRS-4*" trouble of this kind will be prevented by the action of over-pressure valves with which the gas cells are fitted. These are situated in the gangway at the top of the vessel, and in the largest cells as many as four are incorporated. When the pressure rises above a certain limit they open automatically and allow surplus gas to escape. As a further precaution each cell is fitted with a valve that may be opened directly from the control car, thus giving the Commander the power to release gas in all compartments if unusual conditions make this necessary.

The builders of the American airships have one great advantage over those responsible for the construction of similar vessels in other countries—they have a supply of helium at their command. At the present moment the United States almost has a monopoly of this rare and valuable gas. Its lift is little less than that of

hydrogen, the gas usually employed, but, unlike the latter, helium is non-inflammable. In airships with cells filled with this gas, therefore, the risk of fire is small, and, in fact, in the "*ZRS-4*" the danger from this cause is no greater than in a motor car.

One very important result of the employment of helium is that the engines may be included within the framework of the vessel with absolute safety. This cannot be done in airships that obtain their lifting power from hydrogen, for if a spark from the motor chanced to reach the gas, a terrible disaster would follow. It is necessary to place the power plants of such vessels in cars as far away from the gas as possible. These cars are attached to the hull by means of outriggers and care is always taken to supply ample ventilation. Excrescences of this kind increase the air resistance of an airship. For this reason they are made small, and thus the engine crews have to work in cramped quarters. On the contrary, the engine rooms of the American vessels are roomy, and the men in charge of the power plant work under comparatively comfortable conditions.



When completed "ZRS-4" will have the appearance shown in the above drawing, which represents the vessel as it would be seen when flying over the United States battleship "New Hampshire." It will be seen that there are no engine cars below the hull of the vessel.

The number of engines fitted in the "*ZRS-4*" is eight, and these are placed in four engine rooms housed within the ship's hull, only the propellers extending outside the vessel. They develop 4,480 h.p. and give the airship a maximum speed of 83.9 m.p.h. Sufficient fuel may be carried to give a range without refuelling of no less than 10,580 miles when cruising at a speed of 50 knots. Thus when it is completed the giant airship will be capable of flying non-stop nearly half-way round the world!

A very important feature of the power plant of the "*ZRS-4*" is that bevelled gears are employed at the outboard ends of the rigid driving shafts. These make it possible to tilt the propeller shafts to any angle up to 90°, and thus the power of the engines may be employed for propelling the airship up or down as well as in a fore and aft direction. This feature is of special importance when the airship is starting and landing, and when returning to earth the propellers may even be employed to drive the vessel down in order to avoid the loss of lifting gas that otherwise would have to be released.

One of the difficulties that has been encountered in airship practice is that of compensating for the loss in weight as fuel is consumed. As this disappeared an airship tended to rise, and in early vessels it could only be kept at a normal flying level by releasing a quantity of the lifting gas contained within the cells. In the "*Graf Zeppelin*" a very ingenious plan is followed to avoid this. It consists of using a gaseous fuel that has about the same density as air, and allowing the latter to take the place of the gas burned.

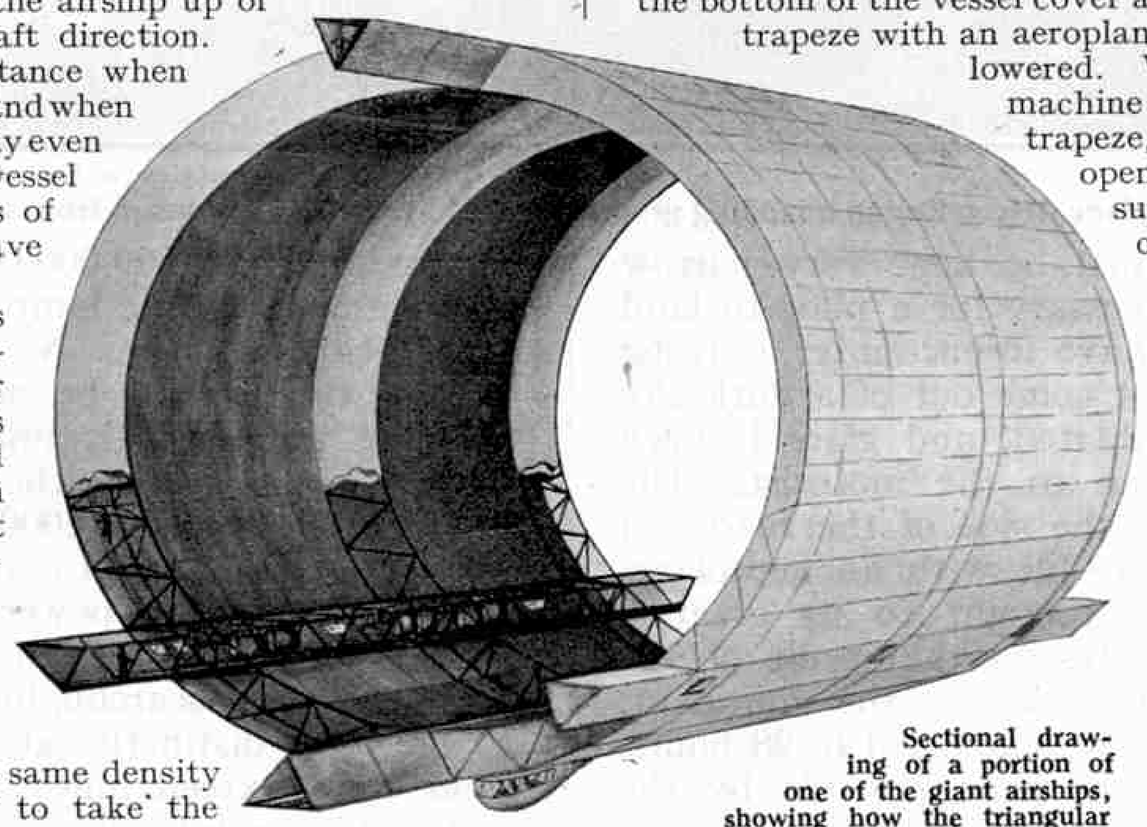
In the case of the "*ZRS-4*" an even more remarkable device introduced by the United States Navy Department is being employed for the same purpose. The engines of this vessel are designed to run on liquid fuel. Among the products of combustion is a proportion of water, and the weight of this actually is greater than that of the fuel burned in the cylinders of the engines. It reaches the exhaust in the form of steam, but by passing the exhaust gases through condensers it is liquified. This prevents the airship from becoming lighter and the water produced also acts as a supply of ballast that may be released in emergency in order to give additional lift.

The condensers installed in order to carry out this novel scheme are very ingenious in construction. The exhaust gases first pass through a system of connected tubes placed between the engine car and the hull of the airship. These are exposed to the airstream and in them the gases are cooled to a very considerable degree. Then they pass on into the condensers themselves. These are large metallic panels extending from the engines up the sides of the vessel, the outer surface of each panel being ribbed in order to obtain the maximum cooling effect. There the steam is finally condensed into water and this flows through separators into tubes that carry it away to ballast bags along the side gangways.

The control car of the airship is placed well forward, and is built as a part of the structure itself. It projects below the streamline, but in order to prevent any undue reduction in speed, it is small in size, being only sufficiently large to accommodate the staff in charge of the vessel. The most modern and efficient devices for the navigation of aircraft are fitted to enable every desired movement to be carried out quickly and easily. Exertion at the wheels in handling the enormous vessel is kept as low as possible by the simple plan of providing each rudder with balancing vanes.

The wireless operator's cabin and the Commanding Officer's quarters are placed directly over the control car, but these are inside the hull. Accommodation for the officers and crew is provided near the middle of the ship and consists of a number of rooms alongside each gangway. Each sleeping room is provided with four comfortable berths, and in addition, there is a large galley with ample cooking facilities.

One of the most interesting features of this giant of the air is that it is itself an aircraft carrier, for within it is accommodation for five complete aeroplanes. These are carried in a huge storage compartment in the lower part of the airship. Collapsible trapdoors in the bottom of the vessel cover a T-shaped opening through which a trapeze with an aeroplane attached to it may be hoisted or lowered. When a flight in a heavier-than-air machine is to be made this is fitted on the trapeze, which then descends through the opening. The aeroplane flies off its support without difficulty and on the completion of a flight may be taken up again with equal ease.



Sectional drawing of a portion of one of the giant airships, showing how the triangular girders are used as gangways and corridors. The car underneath the framework from which the vessel is controlled also may be seen.

The inclusion of aeroplanes in the equipment of an airship is a remarkable step forward. These machines will be of the greatest value for scouting purposes, for they are much faster than the aircraft that houses them, and they will add to the fighting power of the "*ZRS-4.*" Airships generally are vulnerable because of their size and comparative lack of speed, but the two American vessels may be defended by squadrons of fast fighting aeroplanes.

The great shed at Akron in which the giant airships are being built, and in which the completed vessels will be housed when necessary, is built on an enormous scale. It is 1,175 ft. in length and 325 ft. in width, and covers a floor area of 364,000 sq. ft., which is by far the largest of any building yet erected. It is so large, in fact, that four full-sized Association football pitches could be laid out on it. The height from the floor to the platform at the top of the building is 211 ft. thus giving ample room for the airships, the maximum diameter of each of which is 133 ft.

The enormous building is a steel structure, the gigantic arches being supported on concrete footings, (*Continued on page 623*)

The Lighting of Night Air Routes

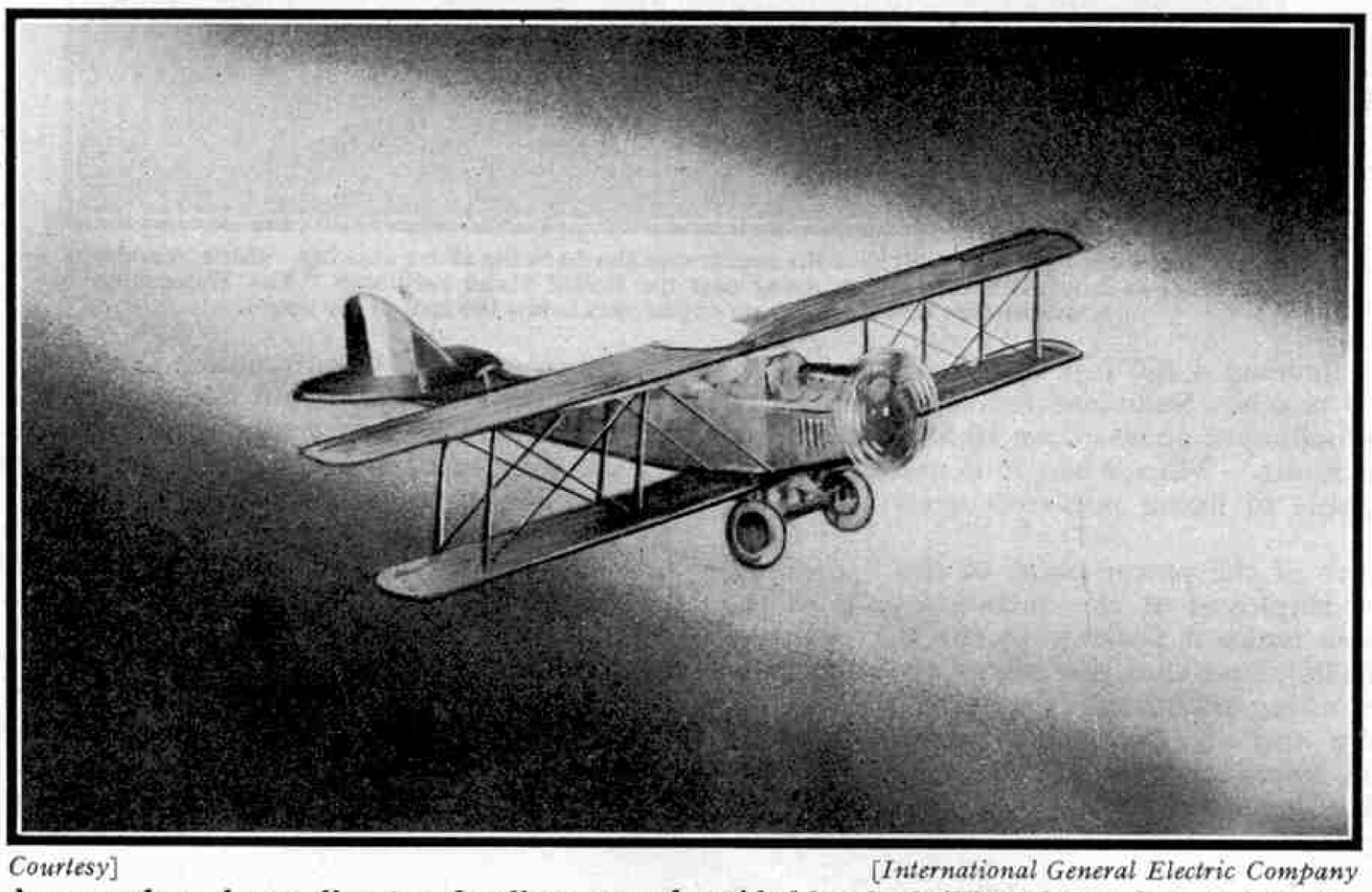
Beacons Across a Continent

AIRPORTS and seaports have many things in common, and notably the necessity for adequate lighting arrangements for craft arriving or departing during the night. In the early days of civil aviation all flying was done as far as possible in daylight, and there was no necessity for any very elaborate scheme of airport lighting. The whole situation changed, however, when night flying began to develop. It was then obvious that, in order to ensure the safety of the machines, an abundance of light must be provided in the form of beacons visible at long distances; boundary, obstruction and approach lights; and lights for the landing ground and hangars and other structures comprising the port.

Several methods of floodlighting the field surface of an airport have been suggested and many of them tried, but it is generally accepted that for all large air terminals single high-powered units of wide spread are best adapted for this purpose. The beam from the large floodlight must be spread to a half-circle in the horizontal plane, but at the same time it must be kept very narrow vertically so that, if it is necessary for a pilot to land facing the light, he will not have to encounter a strong glare. When a pilot has just come out of a dark sky the pupils of his eyes are dilated, and glare is even more dangerous to him than to the motorist. The latter can always pull off to the side of the road and stop, but that is not yet possible with an aeroplane.

Airport lighting has been brought to its greatest perfection in the United States as the result of the development of the night mail across the continent. The journey of 3,000 miles is accomplished in 28 hours, and this flight has only been made possible by the provision of enormously powerful land lighthouses. Before the cross-continental aerial mail delivery was inaugurated, beacons of millions of candle-power were installed to form a gleaming row of giant night eyes from the foot of Lake Michigan to the south-east corner of Wyoming. These lights formed the first installation of their kind in the world; they were the first attempt to illuminate an aerial highway for regular use by aeroplanes. The beacons are erected on nearly 40 sites, mounted on slender steel-legged towers, operated by electric motors and automatically moving their blue-white shafts of light to mark the aerial roadway.

The eastern edge of the "darkness zone" on the trans-continental air mail route is Chicago, where a beacon light of 325,000,000 candlepower has been stationed. At the western boundary of the zone, Cheyenne, Wyoming, 800 miles away, another beacon of equal intensity stands guard. Between them are three others of the same size situated at points where permanent landing fields for the night mail have been laid out—Iowa City, Omaha, and North Platte. At smaller intervals of 25 miles there are beacons of 5,300,000 candle-power marking what are known as emergency landing fields. These smaller searchlights are located at more than 30 towns along the route.



Courtesy] [International General Electric Company

An aeroplane descending to a landing ground, guided by the brilliant beam from a beacon.

If it were possible to merge into one mighty beam of brilliance the illumination given forth by the five searchlights rated at 325,000,000 candlepower, and the 36 searchlights rated at 5,300,000 candlepower, which light the route between Chicago and Cheyenne, the result would be equivalent to the light of approximately 1,800,000,000 candles! The ordinary incandescent electric lamp used in most houses is rated at 32 candle-power. No less than 56,000,000 lamps of this type would be needed to equal the dazzling shaft of this gigantic imaginary searchlight. To put it in another way, the searchlight would provide illumination for 4,600,000 houses of six rooms, each allowing two lamps to a room. By the light of an ordinary 32 candle-power lamp a newspaper can be read at a distance of about six feet. The beam from our imaginary searchlight would enable a newspaper to be read distinctly at the astonishing distance of more than sixteen miles!

The big searchlights set up at the five permanent landing fields at Chicago, Iowa City, North Platte, and Cheyenne, are among the most powerful searchlights in the world. Their rating has been given at various times as 600,000,000 candle-power each, but this is in reality only a theoretical rating that will not be actually attained at any time when the lights are in operation. The rating that indicates the actual illumination intensity is stated by the engineers of the General Electric Company to be 325,000,000 c.p.

Experts of the Post Office Department, in co-operation

Courtesy] [*International General Electric Company*

Diagram showing how the chain of beacons forms a lane of light along the " darkness zone " of the 3,000-mile air mail route across the American continent.

with the illuminating engineers of the General Electric Company, have given long and careful thought to the lighting of the night course and the illumination of the landing-grounds. They have studied every detail that might assist a pilot to fly and land at night with as much ease and safety as during the daytime. As a result all the land lighthouses represent the highest developments in searchlights and the farthest advance yet made by engineers in producing the most intensely brilliant type of illuminating apparatus that science has been able to suggest.

The visibility of the lights is such that the pilots of the night mail flying at high speed 7,000 ft. above the earth are never out of sight of one or other of the guiding beams. The bigger lights can be seen at a distance of 50 miles or more, and the smaller ones are clearly discernible 30 miles away. As soon as he has left one light behind him the pilot immediately picks up the next one, so that his course is marked beyond any possibility of his wandering off the route and becoming lost in the darkness.

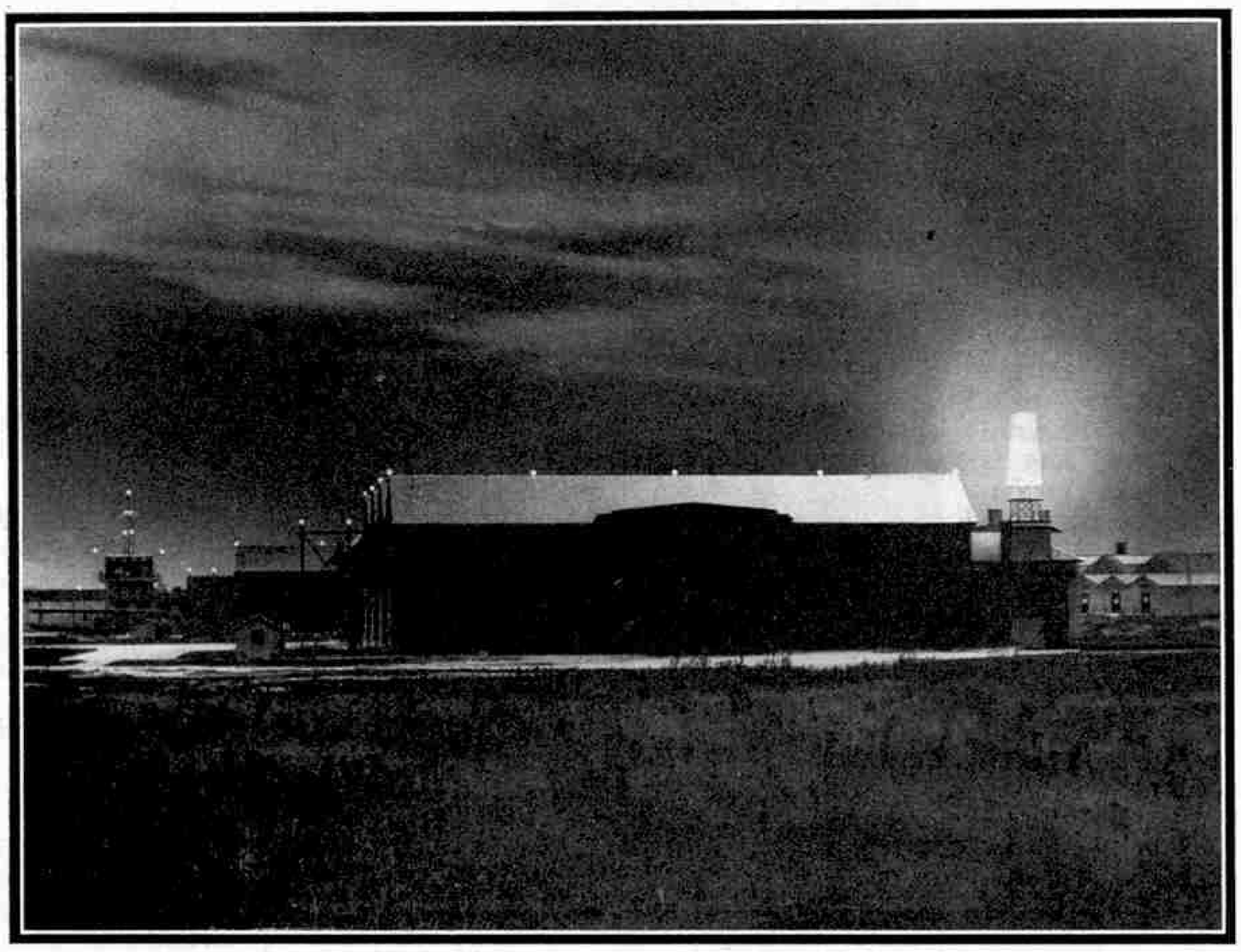
The land lighthouses are electrically-operated. Their giant shafts are always moving slowly and steadily in a huge aerial circle, travelling round and round in their orbits under the control of mechanisms so perfect that they require practically no attention. On the larger lights are installed $\frac{1}{2}$ h.p. motors of a particularly efficient type, while the smaller lights have similar motors of $\frac{1}{6}$ h.p. The large lights on the five main towers are arc searchlights of high intensity having 36-inch projectors; the small lights are equipped with incandescent lamps and have 18-inch projectors.

The landing field beacon light at the permanent landing-grounds is mounted on the same tower that supports the flying route beacon. It is a searchlight of the same intensity, 325,000,000 candle-power, with a 36-inch projector. The only essential difference between the two is that the beam of the landing beacon is directed downward upon the field instead of upward into the air. The fields themselves are outlined in light. Chimneys, poles, towers, and high buildings in the neighbourhood are illuminated, and other prominent objects are made to stand out so that the pilot can gauge the landing levels. The landing-stages, or areas in which the pilot places the wheels of his machine upon the ground, are also clearly marked by light. A brilliantly-illuminated weather cone enables the pilot to see at a glance the direction of the wind on the field at any moment and arrange his landing accordingly.

It is this marvellous system of illumination that has not only made the night air mail service possible, but has brought about a mail delivery between New York and San Francisco on a 28-hour schedule. The mail leaves New York at noon one day and reaches San Francisco by evening of the next day, and a similar arrangement holds good in the reverse direction.

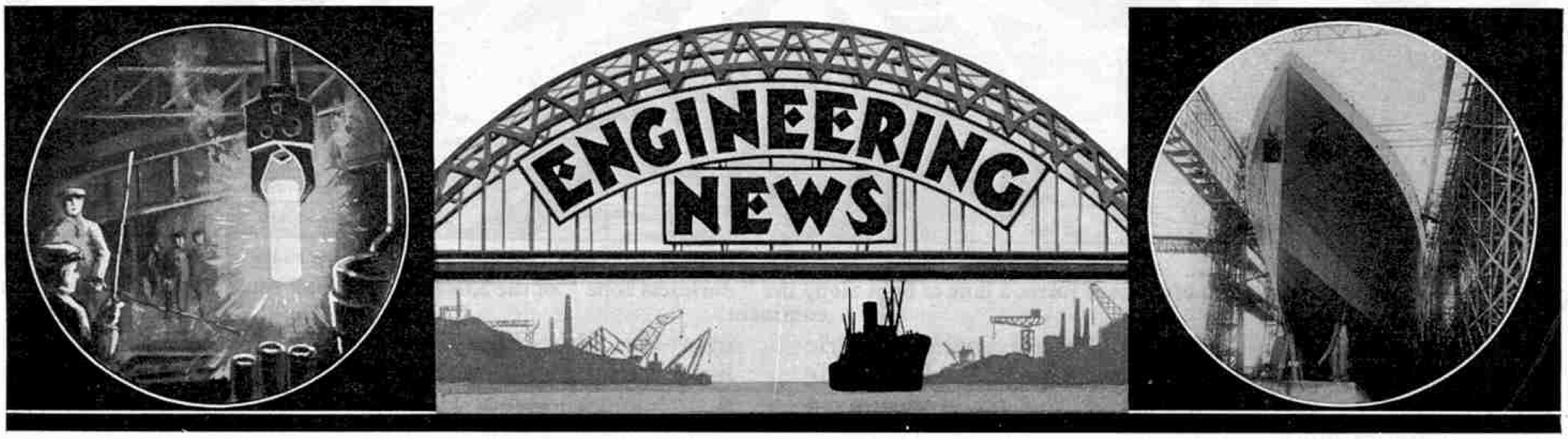
Since the transcontinental lighting scheme that we have described was put into operation, the United States Department of Commerce has installed many new 24-hour airways and the necessary lighting arrangements for them. Schemes already completed or shortly to be taken in hand include some 400 additional airway beacons at intervals of 10 miles each along the new night routes. These are 24-inch beacons each of 2,000,000 candle-power, and they rotate six times per minute. Each beacon tower is equipped with two course lights in addition to the beacon, the lights pointing in the direction of the airway and flashing in code to indicate the number of the beacon along its particular route. If there is no landing ground at the beacon the course lights have red lenses; while green lenses are used at airports and at intermediate landing grounds.

Although conditions in the British Isles do not demand route-lighting schemes of the type of those in the United States, there is the same necessity for adequate lighting of important landing grounds. At Croydon aerodrome, which is the airport of London, the (*Continued on page 628*)



Courtesy] [*Imperial Airways Limited*

Croydon aerodrome at night, showing on the right the neon gas beacon, which has a normal range of 45 miles. The lights that outline the various structures on the aerodrome are also plainly seen.



World's Largest Propellers

The two inner propellers of the Canadian Pacific Steamship liner, *"Empress of Britain,"* are claimed to be the largest that have ever been constructed. Each is 19 ft. 3 in. in diameter and 25½ tons in weight. The cap of each propeller alone weighs 8½ cwt., and their combined surface area is 296 sq. ft.

The two propellers work at a speed of 146 r.p.m. and make use of energy amounting to 22,000 s.h.p. The outer propellers are much smaller, each weighing only 9½ tons, and they make 194 r.p.m. It is interesting to note that the propellers previously holding the world's record for size also were fitted on a C.P.S. liner, this being the *"Empress of Japan."*

The *"Empress of Britain"* was launched at Clydebank on 11th June last. She was built and engined by John Brown & Co. Ltd. The vessel has accommodation for 1,100 passengers and is capable of a speed of more than 24 knots. Her total displacement is 42,000 tons and she is intended for operation on the Southampton-Quebec service. A voyage between these two places will be completed in five days.

Giant Liner to be Built on the Clyde

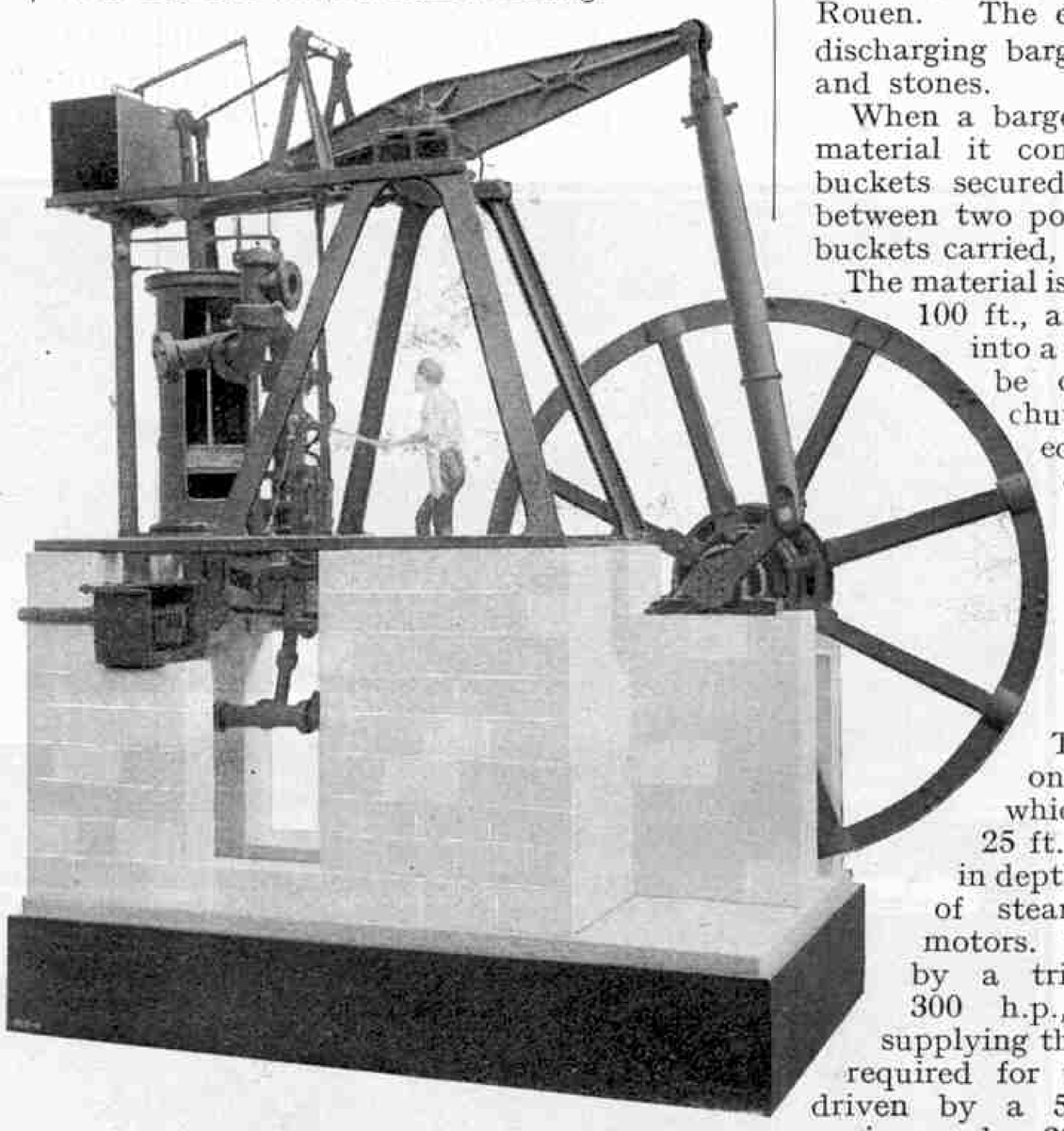
The contract for the huge new Atlantic liner to be built for the Cunard Steamship Company has been placed with John Brown & Co. Ltd., Glasgow. Authentic information of the actual size of the vessel is not yet available, but it is expected that she will displace about 70,000 tons. From this figure it has been calculated that the length of the vessel probably will be about 1,050 ft., while the breadth is expected to be about 120 ft., and the load draught about 33 ft.

It is believed that the machinery of the new liner will be capable of an output of 200,000 s.h.p. and that this will give her a cruising speed of 30 knots. Thus the vessel will be capable of regaining for England the "blue riband" of the Atlantic, now held by the German vessel *"Europa."*

Britain Again Wins Motoring Grand Prix

The International Motoring Grand Prix d'Endurance was won for the fourth year in succession by a British motor car, the machine that was successful in the 24 hour road race being a Bentley, driven by Captain Woolf Barnato and Lieut.-Commander Glen Kidston. These intrepid drivers covered a distance of 1,831 miles in the 24 hours of the race, their average speed being 76 m.p.h. This constitutes a record for the event.

The second place was secured by another Bentley, while the third and fourth machines were both British Talbots. In view of the wonderful record of the Bentleys—the race has been won three times in succession by cars of this make—it is a little disappointing to learn that the firm has decided to discontinue racing.



A working model of a Newcomen engine in the Museum of Science and Arts, Edinburgh. The original of this was erected near Glasgow in 1810, and was in continuous use until 1915. The valve gear was worked by hand and in the reproduction the small figure of a man operates this as required. The model was constructed in the workshops of the Museum.

Grain Elevator on Shore of Hudson Bay

A grain elevator with a capacity of 2,500,000 bushels is to be erected at Churchill, Canada, a new port under construction on the western shore of the Hudson Bay. Work will be begun as soon as possible and the cost of the elevator is expected to be a little more than £400,000.

Churchill is at the terminus of the newly-constructed railway from Western Canada to the shores of the Hudson Bay. Navigation of the Bay and of the channels north of Labrador leading to the Atlantic Ocean is possible for a long period during summer, and the completion of the railway has opened up a new and shorter route from the West of Canada to Europe. It is expected that a portion of this year's grain crop from the prairie provinces will be shipped by this route, and it is hoped to complete the elevator in time to handle it.

Huge Floating Elevator

A huge floating elevator, 2,100 tons in weight, recently has been constructed in Germany for service in the harbour of Rouen. The elevator is to be used for discharging barges carrying dredged sand and stones.

When a barge is being discharged, the material it contains is scooped up by buckets secured to a chain that passes between two pontoons. Each of the 47 buckets carried, has a capacity of 18 c. ft. The material is raised to a height of about 100 ft., and is then allowed to fall into a hopper, from which it may be carried along a washing chute, where the soil is separated from the stones, or shot directly on to the shore of the river. Each of the barges carrying the dredged material has a capacity of from 500 to 800 c. yd., and the elevator discharges one of the larger size in a little more than an hour. The elevator is supported on two pontoons, each of which is 200 ft. in length, 25 ft. in width, and 13 ft. 6 in. in depth. It is operated by means of steam engines and electric motors. The bucket chain is driven by a triple-expansion engine of 300 h.p., while the generators supplying the electricity to the motors required for the other operations are driven by a 520 h.p. triple-expansion engine, and a 220 h.p. compound engine. The steam required is raised by two cylindrical marine boilers at a pressure of 190 lb. per sq. in.

River Tunnel 13 Miles in Length

An interesting scheme for covering up a river is now approaching completion at St. Louis, Missouri. The river is the Des Peres, which flows through the centre of the town. For many years this has been a source of much expense, for during the winter, or when bad weather is experienced, the water overflows and causes great damage to adjacent property.

The idea of covering the river over was thought of many years ago, but it was not until 1924 that work was commenced on a tunnel into which it is to be diverted. This tunnel, which is now almost completed, is approximately 13 miles in length.

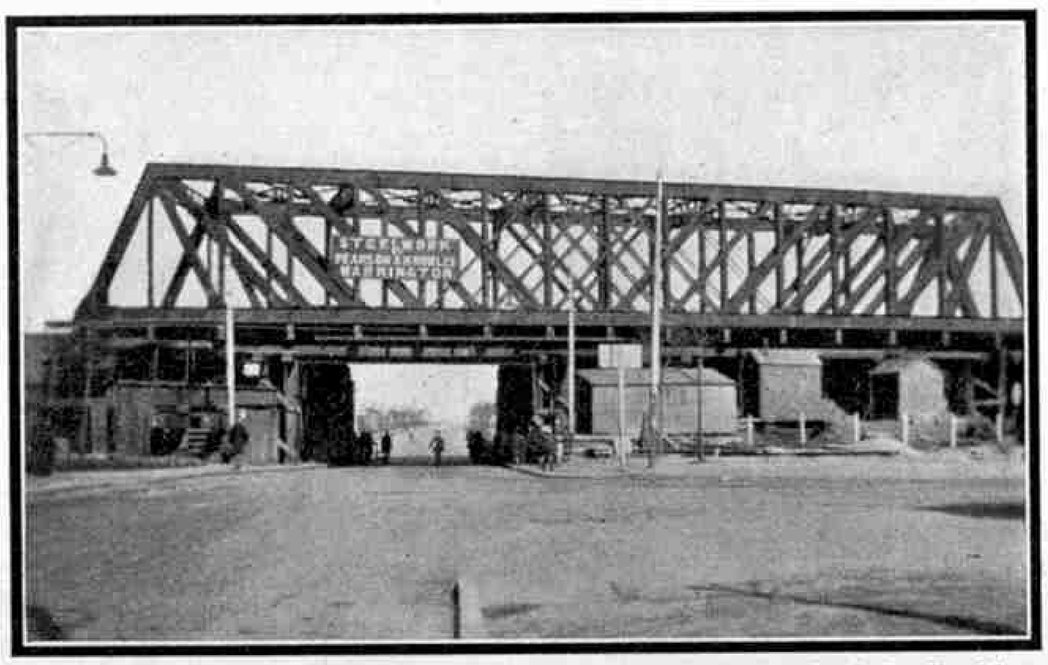
It is interesting to note that along the site of the tunnel about 5,000,000 c. yd. of earth, and 400,000 c. yd. of solid rock have been excavated. For this work large excavators were employed and one of the huge machines installed is capable of dealing with 8,000 tons of spoil every 24 hours.

New Bridge for Cheshire Lines Railway at Liverpool

An interesting piece of engineering work was carried out recently at Walton, Liverpool, when a single span girder bridge was erected to replace a plate girder bridge of smaller dimensions. The new bridge had been made necessary by the construction of a double arterial road connecting one of the Liverpool main roads with the East Lancashire Road that runs from the city to the eastern towns of Lancashire. The situation of the bridge made it important that railway traffic should not be interrupted, and therefore the structure was built by the side of the line, and when complete was moved into position, this operation being carried out on a Sunday.

Early in the morning the preliminary task was commenced of removing the existing bridge. This was first jacked up on four trolleys and then pulled about 40 ft. clear of the embankment by means of winches, the operation occupying about 22 minutes. All was now ready for rolling into position the new 500-ton bridge, which then rested upon four eight-wheeled bogies. It was drawn into place by means of two winches, each operated by six workmen. The progress of each end of the bridge was checked by a workman at intervals of three inches, so that if one end were in advance of the other it could be slowed down accordingly. When the structure was finally in place one end was jacked up by four 100-ton jacks, the bogies were removed, and the rocker bearings, each weighing five tons, were placed in position. This end was then lowered, and similar operations were carried out at the other end, where were fitted the expansion bearings that allow for the free movement of the steelwork under differences of temperature. All that now remained was the laying of the rails. This was quickly carried out, and the first train passed over the bridge at 11.15 p.m.

The principal dimensions of the new structure are length 148 ft. 6 in.; width 31 ft. 6 in.; and depth 23 ft.



New single span girder bridge at Walton that carries the track of the Cheshire Lines Railway over the double arterial road from Liverpool to East Lancashire.

Largest Alternators in Europe

Four slow-speed, three-phase alternators that are claimed to be the largest in Europe have been completed for installation in a hydro-electric power station in Germany. The machines were constructed by a Swiss firm of engineers. They have been designed to have an output of 32,500 k.v.a. at 10,500 volts and 50 cycles. They will run at the comparatively slow speed of 75 r.p.m., and will be driven by four turbines.

The stator of each alternator has an external diameter of 36 ft. 1 in., and the sheet-steel casing surrounding it is 44 ft. 3 in. in diameter. This casing is intended to act as a channel by means of which heated air will be withdrawn, cool air entering the machine from above. The pole wheel weighs 250 tons, and is 30 ft. 10 in. in diameter. It is of cast steel and was made in two main parts. The thrust bearing that carries the upper end of the shaft has been designed to withstand a load of about 900 tons.

Patrol Boat with Turbine Engines

An interesting new German Customs patrol boat, the "*Hindenburg*," has successfully completed a number of trial trips. The vessel is 102 ft. in length, 14½ ft. in breadth, and has a displacement of 60 tons at 4 ft. draught. Her speed is 13½ knots. The most interesting feature of the vessel is the means of propulsion adopted. A small oil-fired water-tube boiler supplies steam for a light-weight turbine, this being a departure from normal marine engineering practice in the case of a boat of this size.

The water-tube boiler of the plant has been constructed for use at a pressure of 350 lb. per sq. in., and a normal steam temperature of 790° F. The turbine is of the compound type and generates 300 b.h.p. The propeller revolves 500 times a minute, the speed of the engine crankshaft being reduced to this by means of a double-geared transmission shaft. The success of the experimental plant installed on the "*Hindenburg*" has led to the construction of other turbine vessels of similar type. The makers are now at work on two boats for Customs patrol purposes, each of which will be equipped with boilers and turbines developing 1,600 b.h.p. The boats will be 7 ft. smaller than the first one, which originally was only intended for experimental purposes. The weight of the engines in the new boats will be 20 lb. per b.h.p., but the makers claim to be able to construct similar engines in which the weight-power ratio is 13.2 lb. per b.h.p.

The bridge shown in the upper illustration on this page was erected at the lineside and rolled into position. In the above photograph two of the rollers are clearly visible.

Canadian Bridge Two Miles in Length

The new bridge across the St. Lawrence River at Montreal was formally opened for traffic on 24th May last. It has been under erection for four years and its total cost has been about £4,000,000.

The Montreal Harbour Bridge is a cantilever structure and ranks as one of the world's greatest bridges. It is nearly two miles in length and the main span is at a height of 150 ft. above high water mark, thus giving ample clearance for the ocean-going vessels that enter the port. The roadway is 37 ft. in width, and ample accommodation for tramways and for passengers also is provided. The completion of the bridge brings the city of Montreal into closer communication with the rapidly expanding suburban districts south of the St. Lawrence. In an early issue of the "*M.M.*" we hope to publish a full account of this important structure.

Japan's Longest Tunnel

The world's seventh longest tunnel is now nearing completion in Japan. This is known as the Shimizu Tunnel, and has been burrowed through a range of mountains in the Western part of the country. The tunnel is 31,831 ft., or slightly over six miles, in length, and is about 2,000 ft. above sea level. Work on it has been proceeding since 1922, and before it is completed it is expected that its total cost will have reached £1,200,000. The use of the tunnel will shorten the coast to coast railway journey through Japan by over 60 miles, or four hours' travelling time.

New Power Station at Swansea

A new power station is to be constructed at Swansea in connection with the South-West England and South Wales section of the scheme of the Central Electricity Board. The site for the station already has been decided upon. This is 285 acres in extent. Of this area, 87 acres will be covered by buildings and the remainder of the ground will be used for tipping and other purposes. An unlimited supply of cooling water will be obtained from the docks at Swansea, a satisfactory arrangement having been made with the G.W.R., the owners of the docks.

At first the station will be fitted with two 30,000 k.w. alternators. Later a 60,000 k.w. machine will be added, and eventually the station will be extended to have a maximum capacity of 240,000 k.w., when the plant will consist of two 30,000 k.w., and three 60,000 k.w. machines. The huge boilers will supply steam at a pressure of 600 lb. per sq. in.

Historic Scottish Bridge to be Replaced

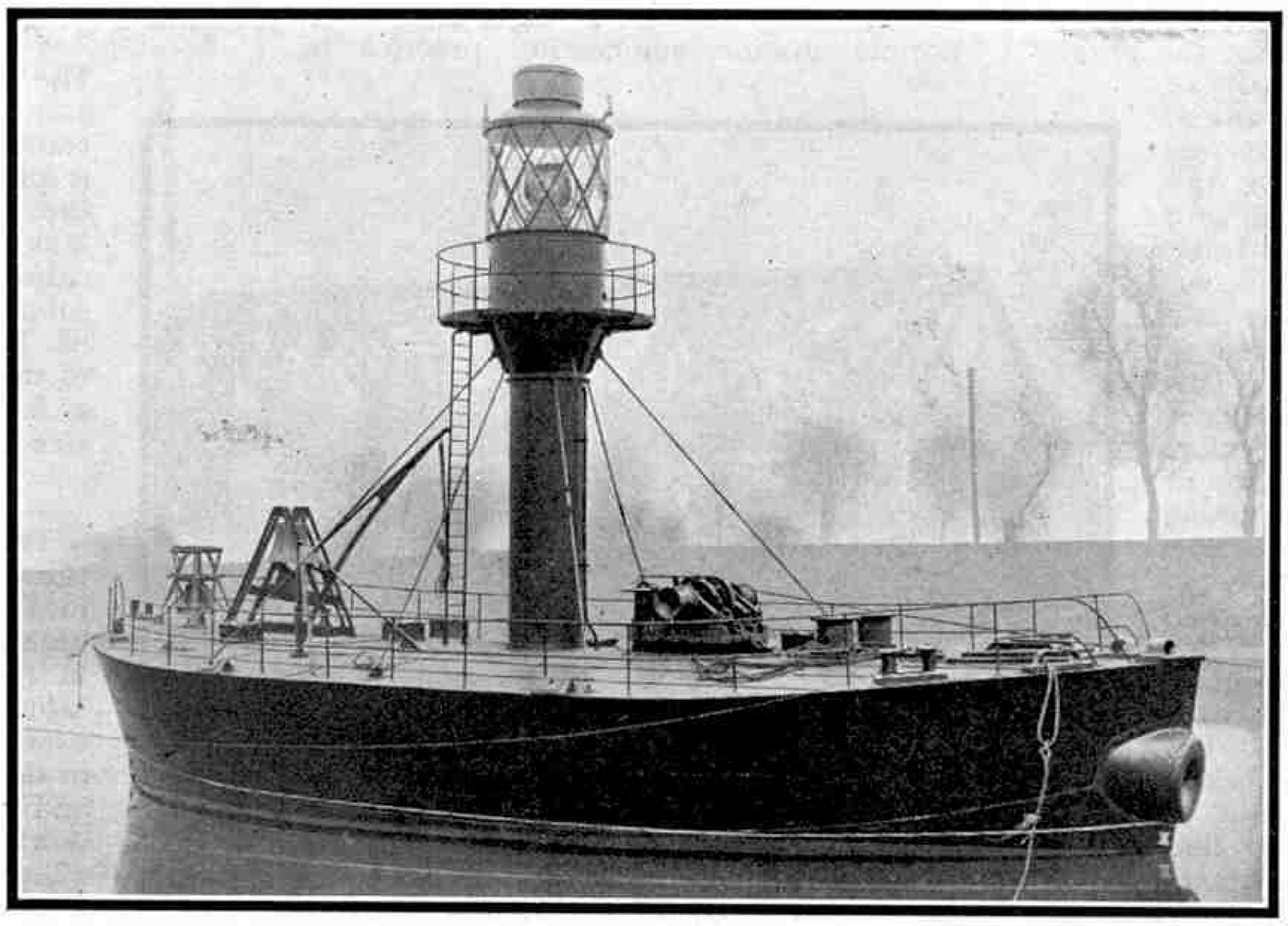
Repairs to an old bridge carrying the main road over the River Spey, near Grantown, are now almost completed, and the bridge is expected to be ready for service shortly, after having been closed since August, 1929.

In order to prevent any further damage being caused to the bridge by the passage of heavy traffic, a new one is to be constructed nearby. It is hoped that this will be completed by August, 1931.

A Lightship that Attends to Itself

Light Valves Sensitive to a Passing Cloud

ONE of the most important developments of recent years in connection with lights for the guidance of ships has been that of lights that automatically switch themselves on and off and are capable of operating without attention for very long periods. This automatic operation has been applied not only to light-buoys to mark channels and fairways, but also to lighthouses and lightships. The fact that such lights need be visited only at long intervals makes them particularly suitable for remote and isolated positions where it would be extremely difficult to arrange for continuous attendance of light keepers.



Courtesy] [*J. Crichton & Co. Ltd.*

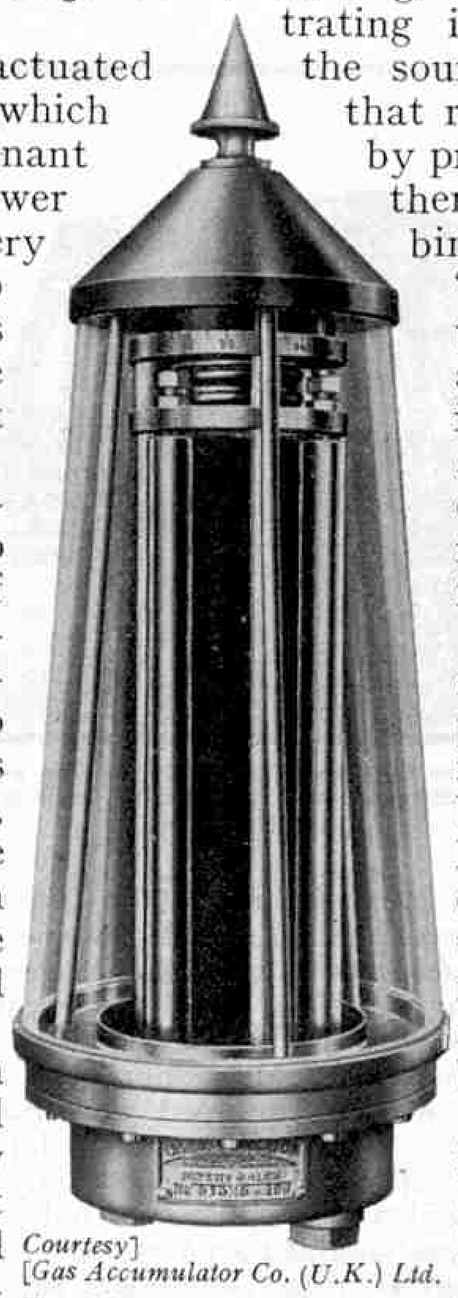
Unattended lightship for service in the Persian Gulf.

Large numbers of lights of this type are actuated on what is known as the "AGA" system, in which dissolved acetylene gas provides the illuminant and carbonic acid gas forms the motive power for the automatic fog bell. Practically every light on the Mersey has been converted to this system, and each of these lights performs its allotted functions for a period of twelve months continuously, without the slightest attention of any kind.

An interesting example of up-to-date automatic equipment is provided by a lightship recently built for service in the Persian Gulf by J. E. Crichton & Co. Ltd., Saltney Shipyard, Chester, to the order of the Gas Accumulator Company (United Kingdom) Ltd., who supplied and fitted the equipment. This vessel was built of extra thick iron plating, instead of steel, to resist the strong corrosive action that occurs in the waters in which she is to be stationed. Her dimensions are length 70 ft., breadth moulded 27 ft., and depth moulded 13 ft. 6 in.

The lines and underwater body have been designed to ensure easy motion of the vessel in a seaway when riding at anchor. Heavy mooring cables are passed through a cast steel hawse pipe, which is centrally situated and built in with the stem. The mast carrying the lantern is 4 ft. in diameter and runs from the keel to the lantern platform, which is over 30 ft. above the waterline. On top of the mast is mounted the lantern with curved glass sections in brass diamond-shaped frames, and within the mast is accommodated the mechanism of the lamp.

This lightship, which has been arranged to work unattended for six months at a time, exhibits a triple flashing light. The revolving lens is composed of six separate katadioptric panels, arranged in groups of three. The object of a lighthouse or a lightship is to provide a distinctive light visible at a great distance, and this is secured by concentrating into one powerful beam all the rays from the source of light. This may be done by mirrors that reflect the light, on the "katoptric" system; by prisms that refract the light as it passes through them, on the "dioptric" system; or by a combination of reflection and refraction, on the "katadioptric" system, which is the one used here. Each of the six panels projects a beam equal to 40,000 candles, from a single incandescent burner at the focal point; and with the rotation of the lens the optical effect is that of a group of three flashes occupying about 8½ seconds, and recurring every 20 seconds.



Courtesy] [*Gas Accumulator Co. (U.K.) Ltd.*

The AGA Sun Valve, showing the light-absorbing black cylinder and the light-reflecting metal rods.

The burner is supplied with a mixture of dissolved acetylene and air, in fixed proportions, and produced from a form of automatic aspirator called a "mixer." The combustion of the mixture results in a hot, non-luminous flame, which causes a mantle to become incandescent. The pulsating action of the mixer is made use of to drive the lens round at the predetermined speed, but no more gas is used on this account than if the burner were employed in a stationary lens.

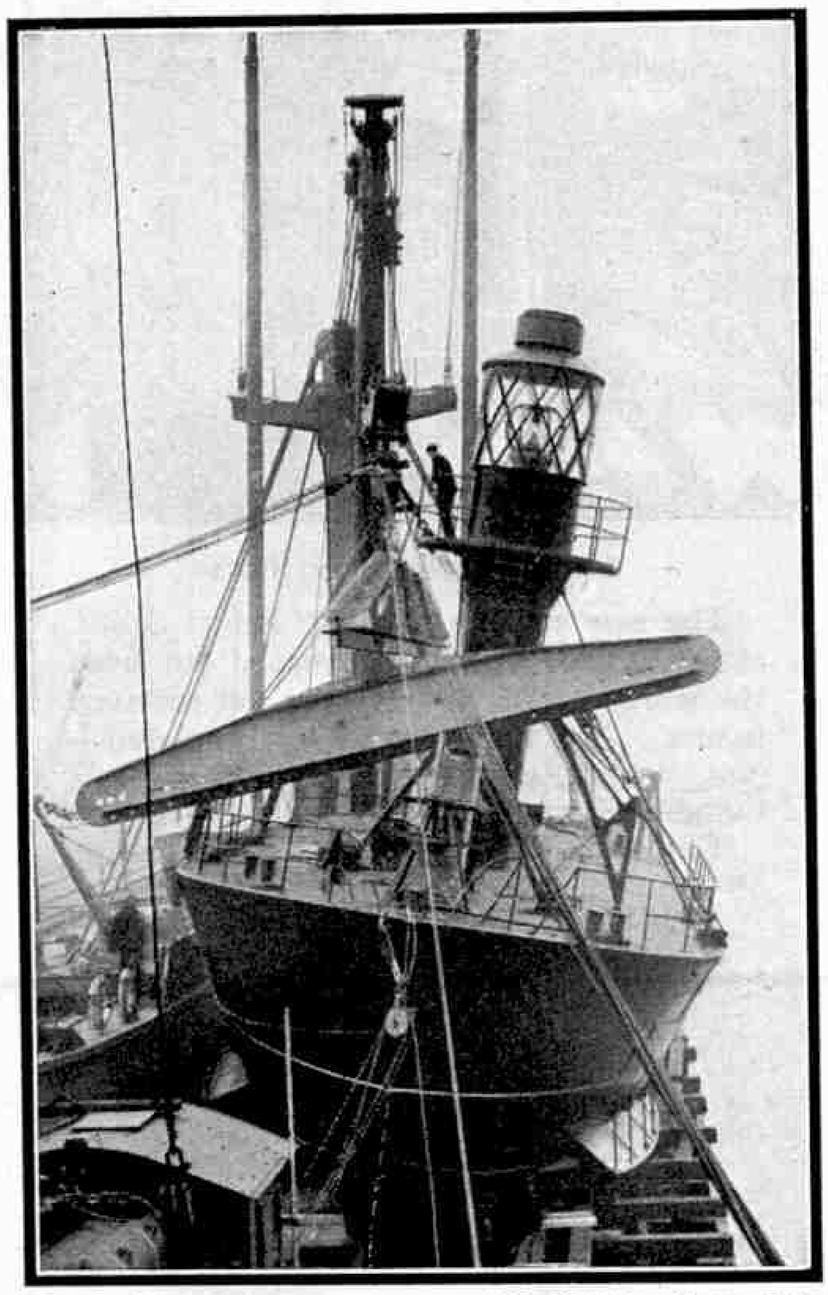
The light is controlled by a light valve in such a manner that it is only in action when natural light fails, irrespective of the hour. The action of this valve—which is popularly known as the "Sun Valve"—results from the fact that a body that absorbs all light falling upon it will, in

consequence, develop a higher temperature than an all-reflecting body similarly exposed. It takes the form of three light-reflecting vertical metal rods symmetrically disposed around a central dead black metal cylinder; the whole being protected by a strong glass sleeve. Upon exposure to light, the light-absorbent cylinder increases slightly in length, whereas the reflecting rods remain unaltered. This slight difference is magnified in a simple and direct manner, and is sufficient to close a gas valve. When light fails, the contraction of the absorbent element allows the gas valve to open and the gas passes again. Heat and cold have no effect upon the light valve, because they cause only expansion or contraction as a whole, and there is no such relative displacement as is caused by exposure to light or darkness.

By the operation of the light valve the navigating light on the ship is extinguished every morning at sunrise, and at the same time the lens ceases to rotate. At sunset the light comes on again and the lens action recommences; and this condition is maintained throughout the night. It is only the main light that is thus affected. A small pilot jet remains burning night and day, and from this the main burner is ignited. The light valve is adjustable to various degrees of sensitiveness, and is capable of responding to the passage of a dark cloud in full daylight!

As the light has to be left alone for six months at a time, it is necessary to provide against a breakage of the incandescent mantle, which is an inverted one. This is accomplished by an ingenious device by which, when the mantle in use is so damaged as to produce a diminished light, it is automatically removed, and a new one, drawn from a magazine, is placed over the burner nozzle. This mechanism is very simple and reliable, and in spite of the apparent delicacy of the duty it has to perform, it is of robust construction.

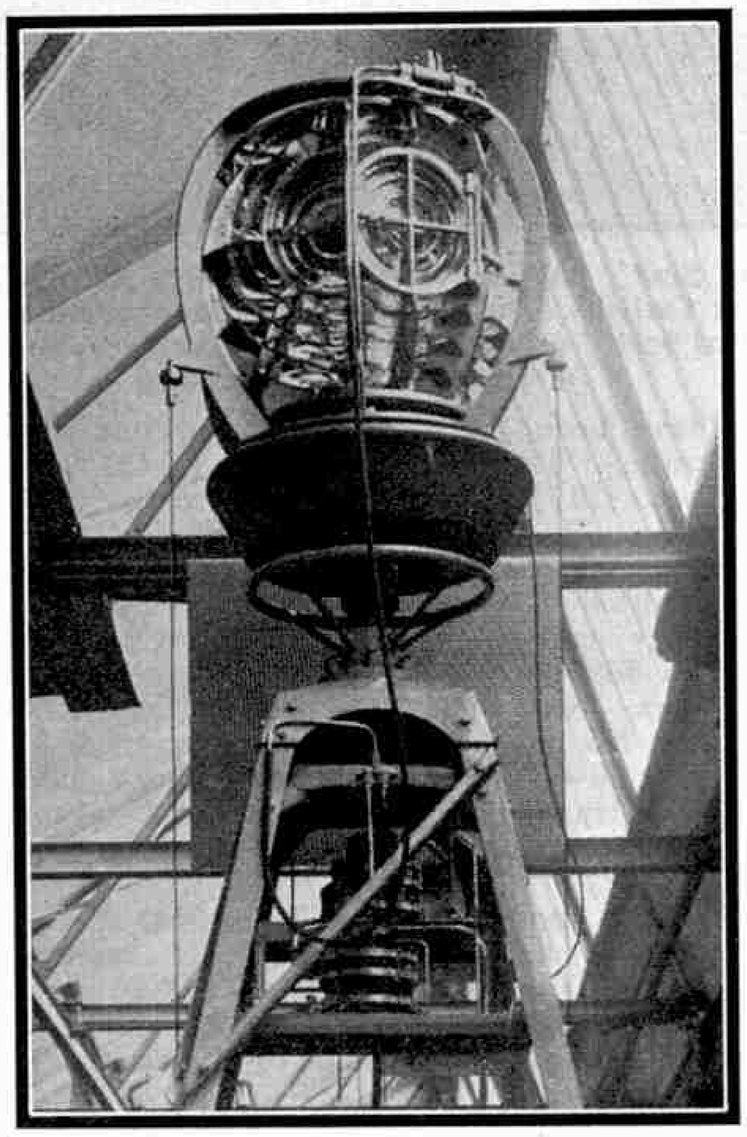
A lightship does not afford a steady platform as does a shore light, and therefore it is necessary to provide some means of preventing the light beams from being thrown above and below the line of vision when the ship rolls and pitches. The "AGA" system includes for this purpose a special form of pendular support for the lens. In this arrangement the lens is carried on a universal ball-bearing joint, the central point of which coincides with the centre of gravity of the lens. Thus the lens is in a condition of neutral equilibrium. Inside the tubular mast, and at the foot of it, a stabilising weight is suspended from a universal joint, and this weight is connected with the lens by pull wires. When the ship inclines, the weight remains hanging plumb and, through the pull wires, compels the lens in the lantern to float level also. This is a great improvement upon the mechanism previously employed for keeping the lens level, which was merely a pendulum in the lantern, consisting of a rod mounted in gimbals, with the lens at the upper end and a bob weight at the bottom. Unless such a pendulum is balanced to a nicety, which is not always possible, it becomes so unruly in bad weather that it is frequently necessary to lash it down, thus rendering the whole mechanism useless. In similar conditions the "AGA" suspension quietly maintains its level, in spite of any oscillations to which the ship may be subjected by the violence of the sea.



Courtesy [*J. Crichton & Co. Ltd.*

The lightship in her finished condition being hauled aboard the transport ship by the latter's own gear.

The ship is provided with an automatically-controlled fog bell, with a gong weighing about half-a-ton. It is sounded by means of a plunger or piston rod, which is driven smartly and sharply forward on its cylinder with great energy by carbonic acid gas at definite and regular intervals. The bell, with its striking mechanism, is placed on deck, and it is tolled once every half-minute. It is governed by a light valve in exactly the same manner as the light, and therefore it sounds whenever the light is in action. There is in addition a bell of the ordinary type with pivoted clappers.

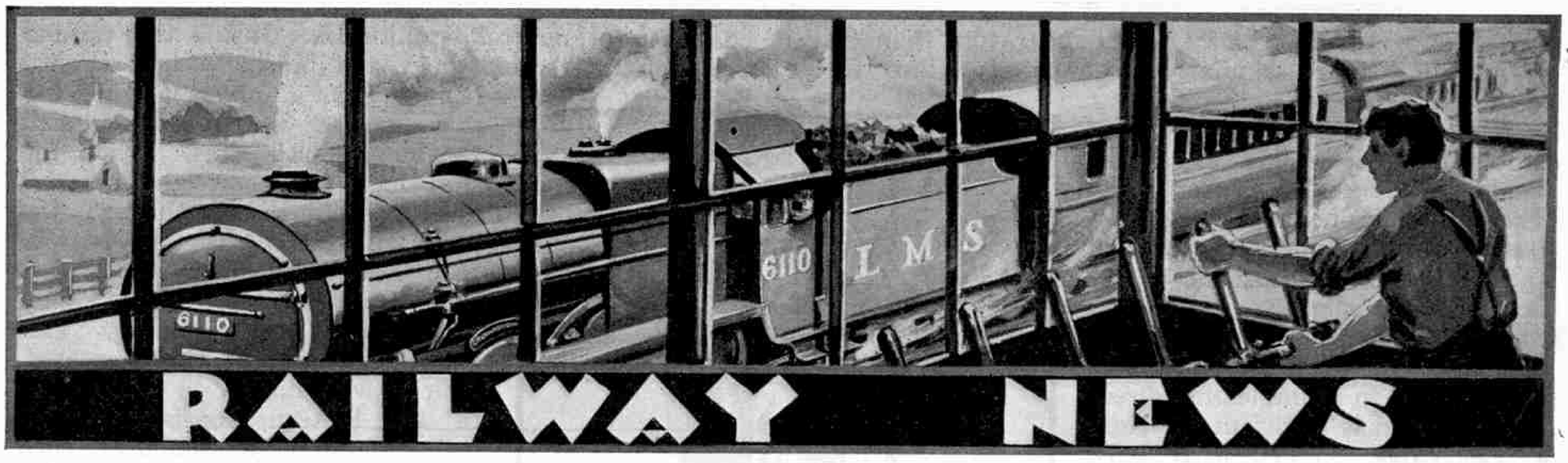


Courtesy [*Gas Accumulator Co. (U.K.) Ltd.*

The automatic revolving lens and lighting apparatus of the lightship, assembled in the works for test.

The cylinders, or gas accumulators, containing the dissolved acetylene, and those containing the carbonic acid gas, are stowed in symmetrical battery formation below deck. They are all of the same size and are easily handled. A light derrick is fitted on deck to facilitate their removal and replacement at the end of each six-month period.

This vessel has the distinction of being the first of her kind to be completed in this country and transported in an erected state to her destination. In her finished condition, except that the lens was removed to guard against the possibility of breakage, she was lifted on board the transport ship by that vessel's own gear, preparatory to being stowed on deck. This was quite a notable achievement, for the lightship weighed somewhere about 130 tons.



L.N.E.R. "No. 10000" in Regular Service

After undergoing tests and making many experimental runs, the high-pressure locomotive "No. 10000" has at length been put into regular service. It was released from the works at Darlington on 20th June, and sent to the Gateshead shed, where it was put into a "link" with a number of "Pacifics." On the following day it worked the up "*Queen of Scots*" Pullman express. On several days it has done the round trip, Newcastle to Leeds, Leeds to York, and York to Newcastle. It will probably be working shortly in the Scottish area.

Twenty locomotives of the 2–6–0 type have been ordered from Sir W. G. Armstrong, Whitworth & Co. Ltd. An order has also been placed with the Sentinel Waggon Works Ltd., of Shrewsbury, for eighteen 100 h.p. double-geared and one 100 h.p. single-geared "Sentinel" shunting locomotives.

The Sentinel Waggon Works Ltd., have recently supplied a special crane locomotive, the purpose of which is to gather and remove the ashes that collect in large quantities at engine sheds. It is working at present at Glasgow.

Electrified Track Extension on S.R.

On Sunday, 6th July, three more sections of the S.R. suburban system were changed over from steam to electric traction. These extensions, in length about 50 miles, brought the mileage of the S.R. electrified tracks to a total of 800—by far the largest owned by any single railway company in the world. The newly-electrified sections are: Hounslow to Windsor, 27½ miles; Dartford to Gravesend, 14 miles; and Wimbledon to West Croydon, 8 miles. The cost of the conversion has been about £600,000.

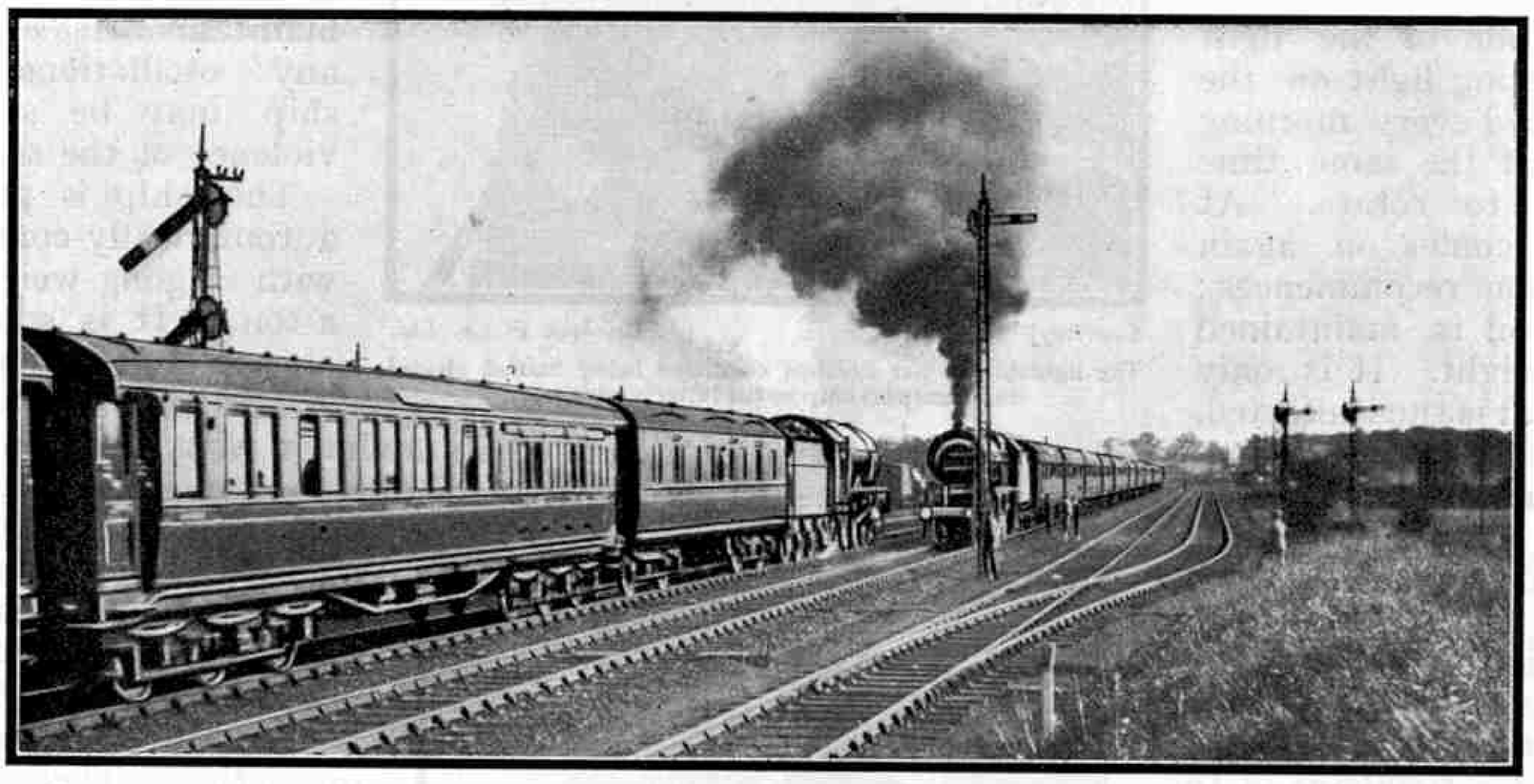
A much more frequent service will now be operated on the lines and the journey times will be shortened considerably. For instance, whereas the steam trains took 67 minutes from London to Windsor, the electric trains will take only 46 minutes.

L.M.S. Locomotive News

The new engines of the "Royal Scot" class that are now being turned out from the works at Derby have not yet received names. The first two to be completed—Nos. 6150 and 6151—are stationed at Camden Shed.

The latest 2–6–2 tanks completed at Derby are numbered 15515-19.

Additional 2–6–0 mixed traffic engines have been built at Crewe and put into traffic. They are numbered 13180–4. Nos. 13175-8 have been sent to the Northern Division. Further passenger engines of the L.N.W.R. types have been adapted to work on the Midland Division. They are: "Prince of Wales" class, No. 5689 "*Caliban*"; and "Experiment" class, No. 5484, "*William Cawkwell*" and No. 5526, "*Bactria.*" Ten L. & Y. type 0–6–0 goods tender engines have been transferred to the Midland Division.



The L.M.S. up "*Mid-Day Scot*" hauled by 4-6-0 locomotive No. 6127, "*Novelty*," passing the Down "*Royal Scot*" near Carlisle. On the latter train is locomotive No. 6129, "*Comet*," both engines being of the "Royal Scot" class. For this fine photograph we are indebted to our reader J. J. Cunningham, Annan.

A Fast American Run

It is reported that a theatrical special recently achieved a record by running from Columbus Union Depot to Cleveland Union Depot, a distance of 138 miles, in 115 minutes, an average of 72 m.p.h.

High Level Bridge, Newcastle

The L.N.E.R. report that sixteen men are engaged in painting the High Level Bridge at Newcastle-on-Tyne and the task is expected to be completed by the end of October. About 12 tons of paint and 1,000 gallons of tar will be used.

New Locomotives of G.W.R. "King" Class

The remaining engines of the new batch of "Kings" have been completed at Swindon, and all are now in service. They are numbered and named as follows: 6023, "*King Edward II*"; 6024, "*King Edward I*"; 6025, "*King Henry III*"; 6026, "*King John*"; 6027, "*King Richard I*"; 6028, "*King Henry II*"; 6029, "*King Stephen.*"

Further tank engines of the 2–8–0 type are now building at Swindon, and several are nearing completion. Additional 0–6–0 goods tank engines have een received from outside firms. These include Nos. 6710-11 from W. G. Bagnall Ltd.; Nos. 7717-18 from Kerr Stuart Ltd.; and Nos. 6732-33 from the Yorkshire Engine Co. Ltd.

The locomotive weigh-table at Swindon will be replaced shortly by a new one of an improved type. The authorities at Swindon are always at pains to see that every engine that leaves the works is perfectly adjusted in order to ensure that the designed weight is carried by each wheel and that the clearances between the tops of the axle-boxes and the frames are sufficient to avoid any knocking or bumping. These adjustments, which are necessary to secure smooth and safe running, are made on the weigh-table.

New Named L.N.E.R. Boat Train

The L.N.E.R. have put on a new boat express daily from Liverpool Street. The new train is known as "*The Scandinavian*" and runs non-stop to Parkeston Quay for the increasing traffic to Denmark via the Harwich-Esbjerg Royal Mail route.

Long Non-stop Run on the "Nord"

For the period of the Belgian International Exhibition, the Northern Railway of France are giving an accelerated run between Paris and Liége. The distance of 229 miles is covered non-stop in exactly four hours, the average speed thus being more than 57 miles an hour.

Special Summer Services

Every railway enthusiast looks forward with keen interest to the special services that are put on by the railway companies for the heavy holiday traffic of the summer months. There are, of course, many standard services that are repeated with little alteration from year to year, but almost every season witnesses the introduction of some new features that show an advance on what has been accomplished previously. In this latter respect, however, it must be confessed that the programmes for the present summer are somewhat disappointing. Although on the Continent a number of greatly improved and accelerated services have been introduced, the British Railway Companies are content to repeat, with but few changes, the services of last year.

On the L.M.S. the "*Royal Scot*" again runs non-stop in each direction between London and Carlisle, a distance of 300 miles. The up day "*Irish Mail*," from Holyhead to Euston, has been accelerated by five minutes, reaching Euston at 5.45 p.m. instead of 5.50. On Saturdays only, it starts 12 minutes later, but by eliminating the stops at Chester, Crewe and Rugby, arrives at Euston 10 minutes earlier at 5.40 p.m., an acceleration of 22 minutes. The popular holiday expresses—"*The Manxman*," "*The Welshman*," "*The Lakes Express*" and "*The Pines Express*"—are all running again.

The L.N.E.R. are repeating the non-stop runs of the "*Flying Scotsman*" in each direction between London and Edinburgh, a distance of 392.7 miles. The time remains at 8 hours 15 minutes and gives an average speed of only 47.6 miles an hour. The "*Scarborough Flyer*" runs non-stop from London to York, 188.2 miles in 210 minutes, an average of 53.8 m.p.h.

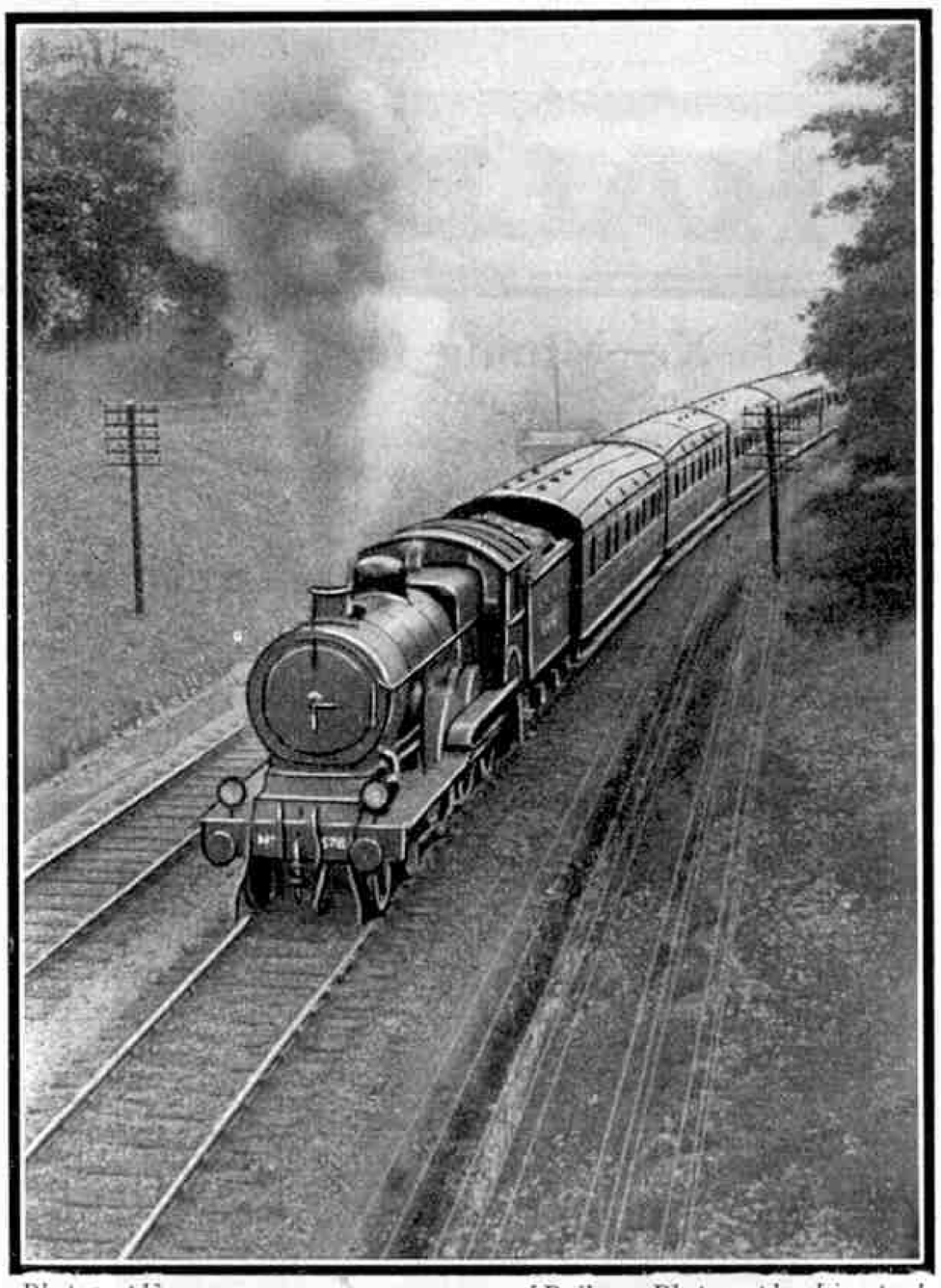
The G.W.R. are still foremost in point of speed, and proudly claim that sixty-three of their expresses daily cover 5,311 miles at 55 to 66 m.p.h. start to stop. The "*Cornish Riviera Express*" is again running non-stop each way between Paddington and Plymouth, 225¾ miles. The "*Torquay Pullman Limited*" now runs every week-day instead of three days a week, as formerly. A new train has been put on to serve South Wales business men each week-day except Saturday. Leaving Cardiff at 8 a.m. it calls at Newport at 8.18, and then runs non-stop to Paddington where it is due at 10.45 a.m. The "*Cheltenham Flyer*" continues to run from Swindon to Paddington at its record-breaking schedule, that has now been in operation for a year, of 70 minutes for the 77¼ miles, an average of 66.2 m.p.h.

The Southern Railway again provides a very full service of holiday expresses to the numerous resorts on their line. The Continental traffic of this railway has attained enormous proportions and this summer there are further new and accelerated services by the short sea routes to France, Germany, Switzerland, Belgium and other parts of the Continent.

A number of new steamers have also been put into service to be run in conjunction with these continental trains from Southampton and Dover. The fleet of steamers plying to the Isle of Wight has also been strengthened considerably.

L.N.E.R. Train Control

In pursuance of their policy of extending the system of Train Control in order to improve the traffic working, the L.N.E.R. have decided to provide a new Train Control Office at Lincoln and extend the system to the sections of line from Lincoln via Market Rasen to Grimsby and Cleethorpes; from Brocklesby to Ulceby and Immingham, and from Grimsby to Werrington Junction (Peterborough) via Louth and Boston.



Photograph] [*Railway Photographs, Liverpool*

Heavy locomotive work on the L.N.E.R. A down Cromer express ascending Brentwood Bank hauled by 4-6-0 locomotive No. 8578, of the G.E.R. section.

Another important feature is the establishment of a Central Control Office at Liverpool Street to co-ordinate and supervise the activities of the District Control Offices at King's Cross, Leicester, Nottingham, Manchester, Leeds, Doncaster and Lincoln.

Rebuilt Bridge over River Cam

The bridge over the River Cam at Chesterton Junction, Cambridge, has been reconstructed and it is now possible for the heaviest types of engines built to the L.N.E.R. gauge to circulate between Whitemoor and Cambridge via Ely.

This facility affords an alternative route into King's Cross from Doncaster and the Northern counties.

Giant Trolley on the G.W.R.

The G.W.R. have designed and built at their Swindon works a special monster trolley for the conveyance of electric transformers and similar loads up to 120 tons in weight. It is composed of two 55 ft. girders which are carried at each end by two six-wheel bogies, making 24 wheels in all. The trolley is 89 ft. 6 in. long over buffers and its unladen weight is 75¼ tons.

The Anglo-Scottish Non-Stop Expresses

The inauguration of the long non-stop runs for the summer season on Monday, 7th July, excited considerable interest on the lines concerned. Quite a large crowd gathered at King's Cross station to see the "*Flying Scotsman*" start at 10 a.m. on its run of 392.7 miles to Edinburgh. "Pacific" No. 2746, "*Fairway*," was at the head of the train, with Driver Ben Glasgow, of King's Cross shed, in charge. A few miles beyond York, the engine crew was changed and Driver Andrew Davidson, of Edinburgh, took control. This change of crew en route is rendered possible by the specially constructed corridor tender with which the engine is provided, by means of which a relief crew travelling on the train can, at an arranged time, come through to the footplate and take over the duties from the first crew, who then retire to a reserved compartment on the train.

On this first non-stop trip of the season, excellent running was made throughout, and Edinburgh was reached seven minutes early. On the same day the corresponding up train was drawn by "Pacific" No. 4472 "*Flying Scotsman*" and also made a non-stop run, arriving at King's Cross at 6.10 p.m., five minutes in front of schedule.

A considerable number of interested spectators also assembled at Euston on the same morning to see the rival train "*The Royal Scot*" leave for its non-stop run of 300 miles to Carlisle. The locomotive was No. 6117, "*Welsh Guardsman*," and the train was composed of fourteen coaches—all entirely new stock and the last word in luxury for both 1st and 3rd class passengers. By doing away with the old waist line, the carriage windows have been deepened, and as the width has also been increased, these new trains are equal for observation purposes to anything provided in America. The upholstery and internal fittings of all the coaches are comfortable and tasteful to the fullest degree.

On the L.N.E.R. "*Flying Scotsman*" trains, some new 1st class coaches have been provided. These also are extremely luxurious and worthy of one of the world's most famous trains.

The World's Biggest Excursion

An unusual feat was accomplished on Monday, 14th July, by the G.W.R. authorities at Swindon. In the short space of 2½ hours 21 special trains were despatched and nearly 20,000 people were entrained at the rate of 135 a minute.

The occasion was the annual holiday of the G.W.R. Locomotive Works at Swindon, which lasts from July 14th to the 21st, when the Works are closed. Altogether 31 special trains composed of 450 coaches were required to remove the 26,466 employees and relatives going on holiday, and if placed end to end these would have had a total length of more than six miles.

At the station the greatest rush came between 4.40 a.m. and 7.5 a.m. on Monday morning when the 20,000 holiday makers entrained in 21 special trains. Each train was numbered in the order of leaving, and the various coaches and tickets marked with a distinctive colour, in order to ensure that the business of entraining should pass off without a hitch.

X.—Mining for Metals

EVERYBODY has read amazing stories of rushes to seek fortunes at newly discovered gold diggings or diamond fields, and has followed with eager interest the exploits of the prospectors whose discoveries have been responsible for them. These hardy pioneers of the mining industry had no adequate knowledge of the conditions under which metals occur. But with crude equipment, and stores to last for a lengthy period, they went out into the wilds in order to look for traces of gold and silver, the two metals for which they searched most keenly. Always believing that a lucky find would bring them fortune, they explored new countries, closely examining every piece of rock and scrutinising every handful of sand.

More often than not the efforts of prospectors ended in failure, but occasionally their rule of thumb methods were successful. Gold was their chief objective, and the first discovery was usually made in the sandy bed of a stream near a mountain range. The practised eye of the prospector detected black sand that appeared likely to contain the precious metal. Immediately he scraped some of it into his shallow pan, which he then filled with water. Swirling this round and round, he carefully washed away the soil and dirt, and when he had tipped the greater part of the contents of the bowl over the side, he looked eagerly for a few grains of gold in the heavier portions remaining.

Perhaps the prospector could only detect a slight yellow coloration at the bottom of his pan, and he then moved on to try his luck elsewhere. But if the yellow specks seemed sufficiently plentiful, he made further trials in feverish excitement. If these showed the presence of the metal in paying proportion he staked out a claim on the ground that appeared to be richest, and rushed off to file the necessary particulars at the nearest claims office.

There was never any need to advertise a discovery of this kind! News of a "strike" always spread like wildfire, and then followed a mad rush to share in the wealth that had only to be dug out of the earth. No obstacles were too great for those who took part in the rush. From all quarters the eager gold hunters set out to reach the diggings. Whether these were in tropical countries across the seas, or in the frozen regions of the far north, they risked everything in the attempt to arrive in time to share in the wealth these were expected to yield. Claims were staked out as near as possible to the one on which the discovery had been made, and the gold bearing earth was shovelled into pans, rocking boxes, crude sluices or some other rough contrivance that enabled sand and silt to be washed away leaving the heavier metal behind.

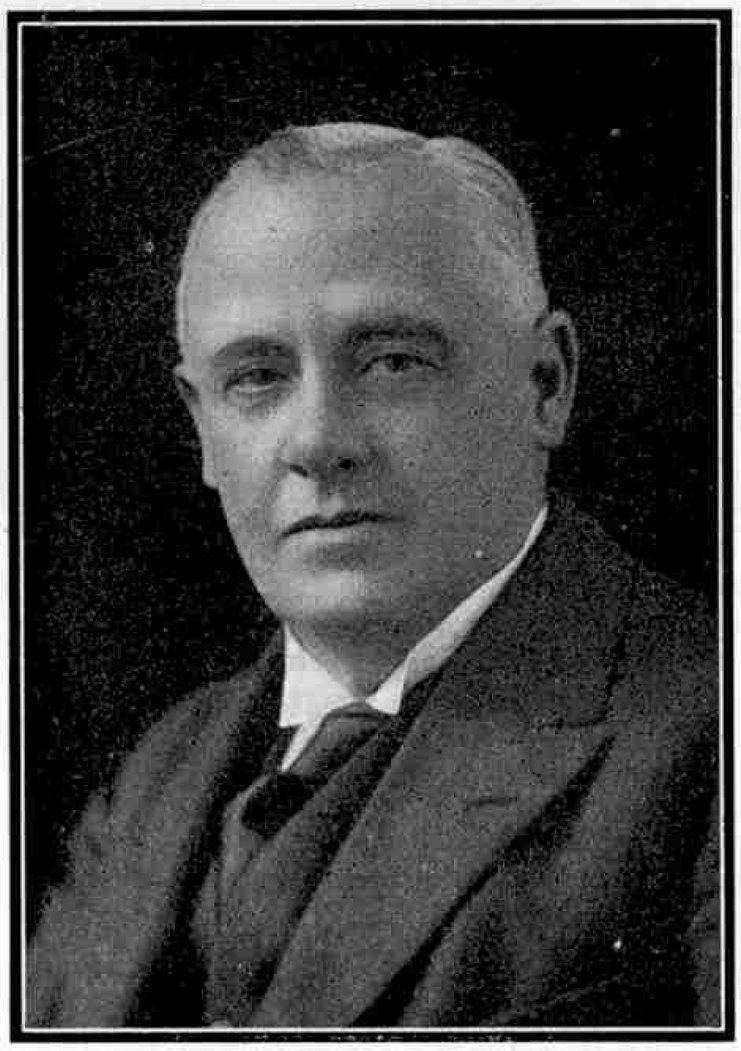
Alluvial diggings of this kind seldom lasted long. Either the available gold was quickly extracted or the cost of digging sufficiently deeply became too great in proportion to the amount of gold recovered. The claims "petered out," to use the expressive term of the miners themselves, and the latter departed, a few to enjoy the fortunes they had made, and others—by far the greater number—to look for further opportunities of becoming rich.

The end of a stampede saw the beginning of scientific mining. When the easily won alluvial gold had been extracted, the search began for the reef from which it had been carried down by the streams in or near which it had been found. This was not always immediately successful, but in many instances the reef was found and the gold-bearing rock was then exploited in an orderly manner. An interesting example is furnished by the Klondyke goldfield. When the mad rush subsided and the gold diggers began to leave, extraction of the metal on scientific and economical lines commenced, and it was found that there was more gold left in the earth than had been taken out of it.

With the great increase in recent years in the demand for metals and minerals of all kinds, prospecting and, indeed, every branch of mining, has become more systematic in character. The lone prospector still exists, of course, but to a very great extent he has been replaced by the exploring party of mining geologists, who employ scientific instruments in order to discover the whereabouts of valuable deposits, and to determine their extent. If successful, these expeditions are followed by the establishment of mines equipped on a large scale with up-to-date machinery, and to-day it may be said that mining engineering, from prospecting down to the extraction of metals from their ores, has become an exact science.

In becoming a scientific industry mining has by no means lost its romantic appeal. One reason for this is that it has been discovered that the earth holds other treasures besides silver and gold. From an industrial point of view metals such as iron, copper and tin are of more value. Other metals that were entirely unknown to the early prospectors acquire almost daily greater value for manufacturing purposes, and lead, zinc, and other so-called base metals, that

FAMOUS ENGINEERS—10



Mr. James Gunson Lawn, C.B.E., A.R.S.M., is President of the Institution of Mining and Metallurgy. Mr. Lawn began his career in the iron ore mines of Furness. Later he became a lecturer at the Royal School of Mines, London, and then went to South Africa as Principal and Professor of Mining at the South African School of Mines, which ultimately developed into the Witwatersrand University, the famous Institution in the midst of a well known gold mining district.

Mr. Lawn returned to practical Mining Engineering in 1903. He was chiefly interested in gold mining, and was responsible for the equipment and working of various mines on the Rand. He is now a Consulting Engineer and a Director of Mining and Metallurgical Companies.

formerly were little prized, are now sought for almost as eagerly as gold itself. The extraction from the earth of such diverse materials as oil, asbestos, graphite, mica, amber and precious stones of all kinds also come within the scope of mining engineering, and to strike oil is almost as sure a road to fortune as to find a gold mine.

Those who adopt this branch of engineering as a profession are sure to find that the life is more adventurous in character than that followed by most men. Whether he has been content to act as a mining engineer in an already established mining district, or has followed in the footsteps of the old prospectors, practically every mining engineer necessarily has spent a considerable proportion of his life in strange lands and in parts of the world into which the civilisation of the West has not yet penetrated. The prospects of making a lucky find that will bring both fame and fortune are, of course, greater in this than in any other profession, but it must not be forgotten that failure may await the best-trained and most lavishly-equipped of those who seek the fortunes that are hidden in the earth, for in this respect Nature is very deceptive. For instance, a deep boring for oil may go unrewarded, while on all sides at a distance of only a few yards other wells may strike underground reservoirs that yield immense quantities of this valuable fluid.

One result of the great strides made by mining engineering in recent years has been an increase in the demand for competent men who have been thoroughly trained in geology and mining science. Formerly the tendency was to give preference to those described as "practical men," by which was meant those who had spent the greater part of their lives in mining operations of various kinds and were familiar with the practice followed in prospecting, in opening new mines, and in the actual winning of metals.

Courtesy [*High Commissioner of Australia*]

A typical scene at an Australian gold mine, showing the tanks in which potassium cyanide solution extracts gold from the crushed ore.

To-day engineers with exact scientific knowledge are required, however. The chief reason for this is that most of the easily accessible deposits of metals and their ores have been very largely worked and there must be very few instances in which the presence of those remaining can be detected with little difficulty by men who have had no special training in the art of probing into the depth of the earth.

It will be realised that anyone who is attracted by the prospect of becoming a mining engineer must be prepared to undergo a thorough course of training. This may be said to begin at school, for the first step is to pass the Matriculation Examination, or one of equivalent standard, the subjects taken being those required to qualify for entrance into the mining engineering department of a University, or into one of the recognised Mining Engineering Schools.

Then follows a course, extending over at least four years, in engineering and mining science. In most Schools of Mining it is recognised that the chief aim of the training is to give the future mining engineer an education that will make him adaptable to the varying conditions he may meet in after years. In the early years of the course arranged, therefore, stress is laid on chemistry, physics, mathematics, mechanics, and the principles of machinery, these being supplemented later by a study of applied electricity, geology, and mineralogy.

It is only when these subjects have been dealt with that any specialisation takes place, and the remaining years of the training period are devoted to surveying, mining, and the whole subject of mining engineering, including mining geology, mining machinery, mineral dressing and assaying. The exact nature of the course followed by each student depends largely on his intentions. For instance, if he wishes to enter the oil industry a course of study on oil field prospecting, drilling and refining is included and his special geological and engineering requirements are dealt with more fully.

During this part of his career the student should aim at securing a degree or similar qualification that will act as a mark of the thoroughness and efficiency with which he has studied for his chosen profession. The Universities in which special attention is given to mining engineering grant degrees to students who show by their general ability throughout their course, and by success in examinations at the end of it, that they are fully qualified, and the Mining Schools grant Diplomas after similar tests.

As an example of a modern training in mining engineering the Royal School of Mines may be mentioned. This is a branch of the Imperial College of Science and Technology, South Kensington, London. The courses of study are of an exceedingly high standard, and at the end of his college career the student who has completed a four years' course of study and passed the necessary examinations is awarded the Diploma of Associateship of the Royal School of Mines (A.R.S.M.). Those who have obtained this Diploma and have spent a further period in research or advanced study may obtain a still higher award. This is the Diploma of the Imperial College of Science and Technology(D.I.S.), and the possession of this is a distinct mark of competent knowledge of mining engineering.

Students of the Royal School of Mines may also take the mining and engineering degrees of the University of London. The courses that qualify for the Diplomas already referred to also provide candidates for this degree with the necessary training and thus the two may be taken concurrently. The University of London offers external degrees in all branches of education, and those that are particularly valuable to mining engineers are the B.Sc. (Engineering) degree in mining or in metallurgy, and the B.Sc. (Special) degree in mining geology or in oil technology. Other universities in this country offer similar degrees to students who have followed with success the courses in mining engineering that they provide.

In some cases students who wish to enlarge their experience may find it desirable to study mining engineering at a University or Mining School abroad. Both in European countries and in overseas dominions there are excellent Mining Schools. Many of these are situated near interesting iron, tin, lead, gold, salt or radium mines, visits to which form part of the work carried on. Good use also may be made of these institutions by those who have successfully completed a course of training at home and wish either to acquire a foreign language or to broaden the experience they have already gained.

When the training period has been completed the newly qualified mining engineer naturally looks for a position in which he may make use of the knowledge and experience that he has acquired. It may be said at the outset that the prospects of a really well trained mining engineer are excellent and, given physical health and a natural liking for open air life, a man of average ability should experience little difficulty in securing attractive employment. Of course, it is impossible to say whether the conditions in any industry will remain the same over a period of years, but at the moment there is ground for the belief that the demand for mining engineers of all kinds is growing.

The actual work a mining engineer may be called upon to do varies considerably in character. On the one hand he may adopt the safe course of seeking a post on the staff of a large mine or group of mines, with a view to qualifying as a surveyor, overseer or manager. The initial rate of pay that he may expect is from about £200 to £400 per annum, according to the situation and importance of the mines in which he is employed. On becoming an overseer this would increase to perhaps £500–£800, and on promotion to a position as manager a still higher salary may be expected. The best positions, of course, are managerships in really large mines, these carrying salaries (*Continued on page 672*)

Spraying Metal at 3,000 Feet per Second

A very simple but effective means of coating the surfaces of many materials with a fine layer of any desired metal has been developed. The metal to be deposited is fed in the form of fine wire into a tool that includes an oxyacetylene blow pipe. As the wire passes through the flame, it is melted and a blast of compressed air blows it into a spray of extremely fine particles. These have a speed of about 3,000 ft. per second, and are driven into the surface layer of the material to be covered, with the result that the metallic coating practically becomes part of it.

The thickness of the covering that may be applied in this manner may be varied from one thousandth of an inch upwards. The tool by means of which it is sprayed on weighs only 3½ lbs., and the outfit is portable and may be taken to the work. The interior surfaces of tubes may be coated by means of a special attachment, while small parts are treated by turning them over and over in a rotating barrel while the metallic spray is directed upon them.

Since the metal covering adheres so closely a very thin layer is effective and thus the process is comparatively cheap. It has been estimated that to give iron or steel a coating of zinc only 0.0004 in. in thickness gives protection from rusting equal to that derived from the best galvanising process.

Machine that Types Words

An inventor has made yet another effort to increase the speed of typewriting by the introduction of a machine that prints words as readily and easily as an ordinary typewriter produces single letters. The keyboard of the new instrument is much larger than that of an ordinary typewriter, for 54 additional keys are required in order to introduce what are called "word groups," or combination of letters, that have been selected because of their occurrence in many common words.

Under each letter a sufficient number of word groups is included to enable practically all ordinary business correspondence to be carried on by the use of the new machine. The actual number of words required is surprisingly small; for it has been found that more than 98 per cent. of business letters can be compiled from a stock of only 1,000 words. Thus the task of providing the required number of word groups is not so great as would be imagined.

One of the difficulties encountered in the construction of the machine was the necessity for spacing. Pressure on one of the keys of an ordinary typewriter moves the carriage one space to the left. In the new machine it is necessary that this should travel over as many spaces as there are letters in the combination used, and a very ingenious mechanism has been devised to enable this to be done. It comes into play on pressing two keys in succession. One of the keys represents the initial letter of the combination to be used and the second represents the actual combination or word group that is desired.

Courtesy [*Supermarine Aviation Co.*

At high speed in a tiny air raft towed by a motor boat.

In order to deal with words that are outside the groups allowed for on the new machine an ordinary typewriter keyboard is included. The actual type that makes the impression on the paper is mounted on an assembly of revolving discs similar to those used in speedometers, and the speed of operation of the machine is more than 300 words per minute.

Boat Rolls at 80 Miles Per Hour

A curious boat that may be said to roll on the water has been invented by an Austrian. In appearance it resembles a steam roller, for it is supported on five cylindrical pontoons. On the steel framework of the vessel is mounted a 500 h.p. motor that drives an aeroplane propeller.

The craft is balanced by small pontoons carried on outriggers at each side of the vessel, and it is controlled from a cockpit in the rear. The novel boat is said to be capable of 80 miles per hour.

Alloy for Use at High Temperatures

A new alloy named "Konel" has been developed in the Research Laboratories of the Westinghouses Electric Co. Ltd. The new metal is harder to forge than steel, and it retains its toughness at a higher temperature than other metals and alloys. For this reason it is expected that it will be very largely used in making moving parts of internal combustion engines, and for other purposes where metal is exposed to a high temperature.

Konel has been introduced particularly for the manufacture of the filaments of wireless valves, in which it replaces platinum. This effects a great saving in cost, for the new metal costs only a few shillings a pound, while platinum is worth £36 an ounce. It has been found that a Konel filament is effective at a temperature 175°F. lower than that required for one made of platinum, and consequently it has a much longer life.

Improving the Air!

"Artificial air" that is far more satisfactory in character than ordinary air is the invention of an American chemist. This is a mixture of oxygen and helium and its producer expects it to be invaluable for use in submarines and in aircraft that fly at high altitudes.

It is well known that ordinary air contains four-fifths nitrogen and one-fifth oxygen by volume, the nitrogen being inert and merely diluting the oxygen. In the "artificial air" it is the nitrogen that is replaced by helium. The resulting mixture is considerably lighter than air and the crew and passengers of an airship in which it is used would be able to live quite comfortably inside the actual gas bags! It is also suggested that pilots of aeroplanes flying at great heights would benefit if the mixture were substituted for the concentrated oxygen now used, and that in a similar manner it would be very serviceable to the crews of submarines.

During experiments in which this mixture was tested it was found that mice and guinea-pigs lived longer in natural air than in a mixture of pure nitrogen and pure oxygen in the correct proportions. This was taken as a proof that a certain proportion of the rare gases of the atmosphere, one of which is helium, is necessary to life. To a certain extent this was confirmed by the fact that a mixture of oxygen and helium proved to be greatly to the liking of mice allowed to live in it.

It is interesting to recall that helium is now used in restoring to normal condition workers under high pressure who suffer from "bends." This disease is caused by the formation of bubbles in the blood when pressure is reduced too rapidly.

Folding Raft for Use on Aeroplanes

Two of the illustrations on these pages show an air raft that may be folded up into a very small space, packed into a case and stowed away in a locker on an aeroplane. It is made of rubber and is prepared for use by merely opening it out and inflating it. It is provided with sculls, is capable of holding two people comfortably, and is chiefly designed for the use in emergencies of occupants of aircraft that are compelled to descend when at sea.

As one of our illustrations shows, the raft also is useful in aquatic sports, and to be towed on it at great speed behind a motor boat is quite a thrilling experience.

Courtesy [*Supermarine Aviation Co.*

The folding air raft described on this page is large enough to accommodate two persons.

Pen that Writes Six Lines at Once

There must be few schoolboys who have not experimented with penholders carrying two nibs in the hope of being able to devise a satisfactory system of reducing the labour of writing "lines." As a rule, these experiments have ended in comparative failure, but an older inventor who has taken up the problem has succeeded in constructing a pen that will write six lines at once.

The purpose of the invention really is to make less arduous the work of signing cheques. In it six penholders are attached to a framework that allows movement in all necessary directions, and this is constructed in such a manner that the movements of the pen fixed to it at one end are faithfully reproduced by the remainder. In order to make use of the instrument the cheques to be signed are placed in position and the person signing them takes the end pen in his hand in the usual manner. As he writes his signature, the machine duplicates it on the other five cheques.

Penny-in-the-Slot Door Bell

A novel door-bell has been invented in Bohemia with the object of preventing ringing by beggars, hawkers and other unwanted visitors. The bell only operates when a small coin is dropped into a slot on a mechanism affixed to it. Opening the door returns the coin, and it is hoped that the necessity for putting in a deposit in this manner will put an end to the nuisance of having to reply to rings from various types of irresponsible people.

In combination with windows that overlook the door the device would help to give protection from disturbance by undesirables, for these would lose their money if the door were not opened.

Launch that Travels Overland

A "boat train" that is capable of safe travel on both land and water has been invented by a Belgian engineer. It is intended for service in the Belgian Congo. There the rivers are the most important highways and for boats or barges of shallow draught the Congo and its tributaries are navigable for a total length of 9,000 miles. The linking up of different parts of the country by boat is impossible because of the existence of innumerable rapids and cataracts.

It is to overcome obstacles of this type that the boat trains have been designed. They consist of a number of barges linked by means of ropes and hauled by a steam launch. The barges may be fitted for freight or passenger carrying purposes. Each has two ordinary steel hulls and these are placed side by side and separated by a space about two feet in width. They are securely fastened together into a single unit about 18 ft. in breadth. The space between them is covered over and the gangway so formed acts as a kind of bridge on which to mount the controls. Beneath the gangway are two pairs of wheels.

The launch is constructed in a similar manner, the only difference being that in each hull a 150 h.p. steam engine is fitted.

When the train is required to travel through water the launch and barges do so

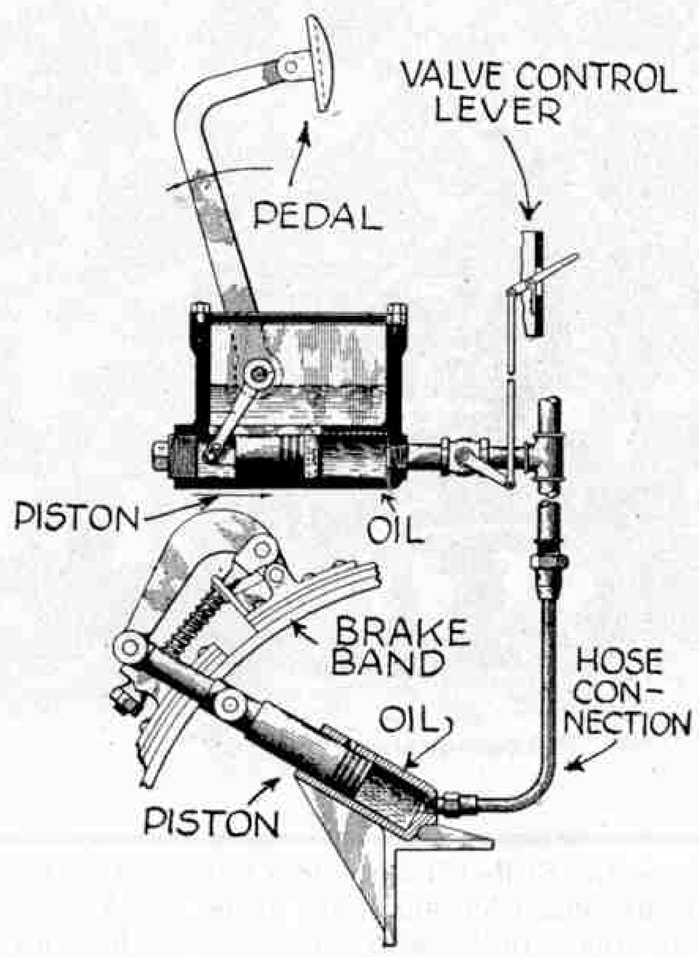


Diagram showing how the hydraulic brake described on this page works.

in the ordinary manner. On approaching a cataract they are steered to a point on shore where a rail track carried on piles is constructed. The launch is guided over the end of the rail and the drive is transferred from the propeller shaft to the wheels, on which the vessel runs along the rail and hauls after it the barges. The journey overland is continued until the rapids or cataracts have been passed.

How Hydraulic Brakes Work

The almost universal adoption of 4-wheel brakes on motor cars has directed attention to the principle of the hydraulic brake, and many boys (and grown-ups, too!) have been puzzled to know just how they work. The diagram on this page shows the action.

The brake pedal is fixed to a pinion that operates in a cylinder filled with oil. This is connected by flexible hose to cylinders on the brake drums. In each of these cylinders is a piston connected to the brake band. When the brake pedal is depressed the oil is driven through the hose and moves the pistons; they in turn draw the ends of the brake bands together, causing them to grip the drums and so bring the car to a stop.

The amount of pressure on the pedal required to operate the brakes is readily adjusted by a valve that regulates the flow of oil.

One of the great advantages of hydraulic brakes is that they automatically equalize themselves. In other words, it is impossible to have one brake band lock its wheel while the other wheel is not locked—one of the main causes of skidding.

The transmission of power by means of oil has proved especially useful in designing front wheel brakes, for the pipes containing the fluid are flexible and therefore turn with the wheels as these are turned for steering purposes.

A hydraulic motor car brake of a new type recently has been invented. Most hydraulic brakes act in the manner described above and only utilise liquid pressure to apply brake shoes to drums. Thus they are really friction brakes. In this invention it is the liquid itself that actually resists the revolution of the driving shaft and therefore of the wheels.

The central feature of the hydraulic brake is an oil pump that is keyed to the shaft between the gear-box and the back axle. Normally the blades of this pump are withdrawn into the inner rotor. Pressure on the brake pedal releases them and causes them to rotate in the oil. As they do so they pump the liquid through a short circuit containing a control valve. By closing the valve excessive back pressure is placed on the pump and this has the effect of slowing down the motion of the blades and consequently of the driving shaft. The action is equally effective whether the car is being driven in forward or reverse gear.

A brake of this type is readily controlled by means of the valve. This is operated or closed by a foot pedal of the usual type, more or less braking effect being produced as this is pressed down or allowed to spring back.

In ordinary types of brakes, wear and tear on the brake drums, shoes and the brake rods is considerable, and these require constant inspection and occasional renewal. The hydraulic brake is free from trouble of this kind, for there is no pressure when the brake is not applied, and adjustment for wear is quite unnecessary. In addition, the brake is self-oiling.

XX.—HOW ELECTRIC LAMPS ARE MADE

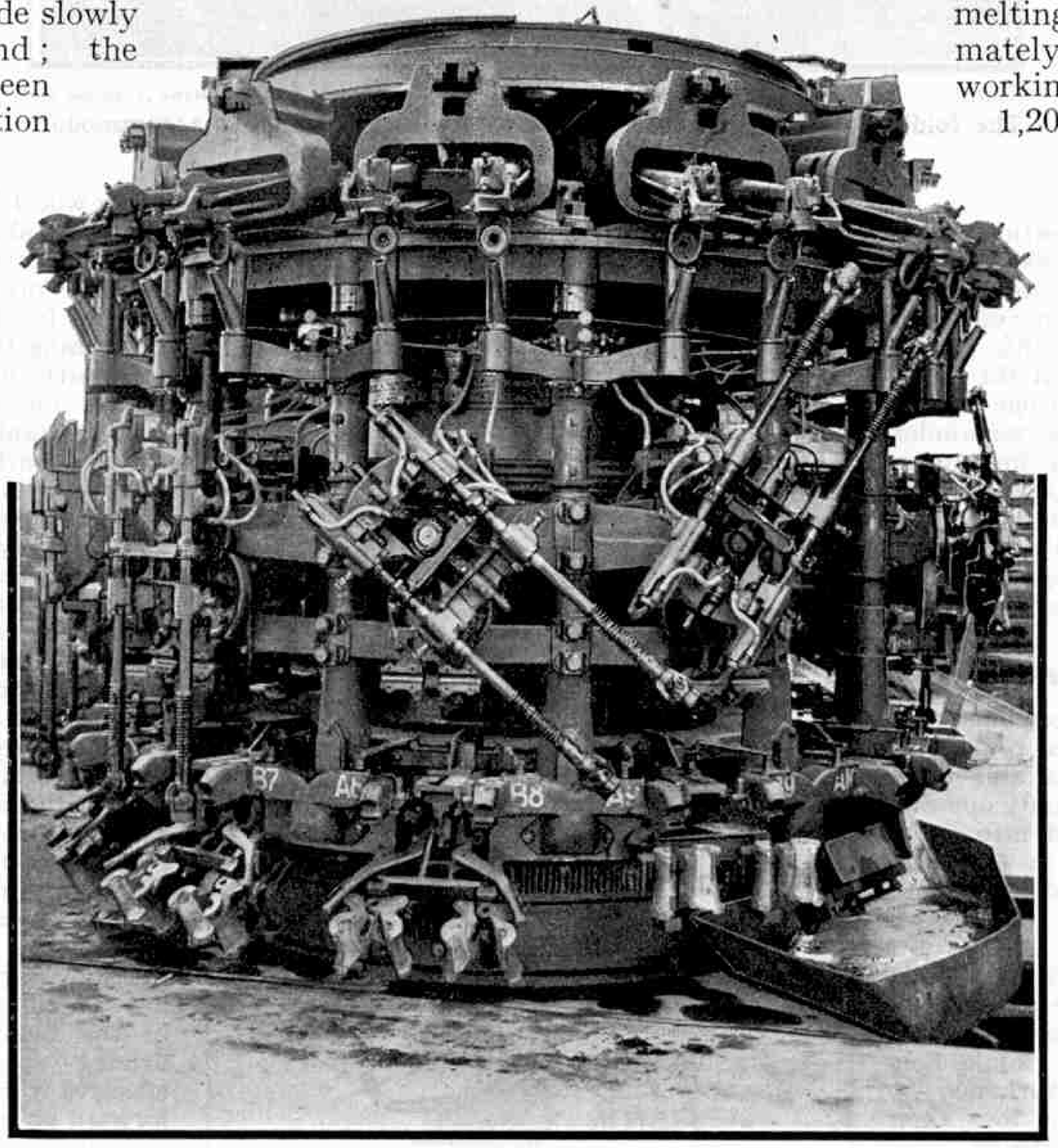
IT is just 50 years since the commencement of the manufacture of electric incandescent lamps on a large scale. During that period production has increased enormously and now more than 600,000,000 lamps are made annually, of which huge total about 30,000,000 are produced in this country.

The early lamps were made slowly and laboriously by hand; the present vast output has been attained by the introduction for practically every operation of high-speed electrically-driven machinery.

The making of a present-day electric lamp involves a large number of operations, which may be divided into three groups—the blowing of the glass bulb, the formation of the filament, and the assembly of the various components.

A large proportion of lamp bulbs are now made of soda-lime glass, the chief constituents of which are soda ash, lime and sand. It is very important that the proportions of the ingredients in the glass should be constant, and special weighing apparatus that ensures a high degree of accuracy is employed. When the correct quantities of the raw materials have been weighed out, they are thoroughly mixed and then discharged into a storage hopper. When a batch of the mixture is required, a certain weight of "cullet" or broken glass is added, and the whole is thoroughly crushed in a roll jaw crusher.

The crushed mixture is passed to a furnace having a capacity of 40 tons or more. This furnace takes the form of a large tank mounted level with the top of a bulb-blowing machine, and is built of fireclay blocks, with a roof of silica brick. It is divided into two parts, known respectively as the melting and the working compartments. The glass mixture is fed automatically to the melting compartment, from which later it flows in a molten condition to the working compartment by way of an opening in the base of the dividing wall.

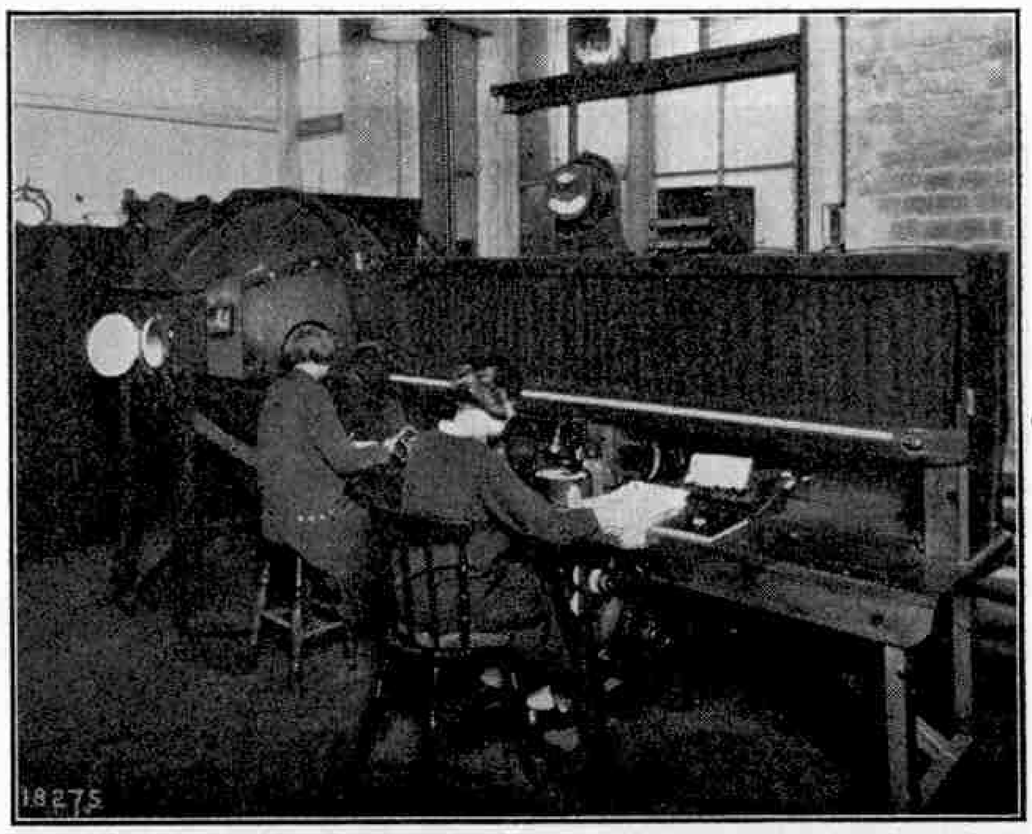


"Westlake" Automatic Bulb-Blowing Machine at the Mazda Works. This wonderful machine produces 55,000 lamp bulbs in 24 hrs. For this and the other illustrations to this article we are indebted to the courtesy of the British Thomson-Houston Co. Ltd.

The temperature of the molten glass in the melting compartment is approximately 1,400°C., and in the working compartment about 1,200°C. The furnace is cooled externally by air, and this creates a layer of slightly cooler glass next to the fireclay blocks. In this manner the life of the furnace is lengthened, but even so the heat of the "metal," as the molten glass is called, is so intense that the fireclay bricks have to be renewed about every 12 months. Two indicating instruments are mounted on the furnace, one of which records the exact level of the metal and the other its temperature.

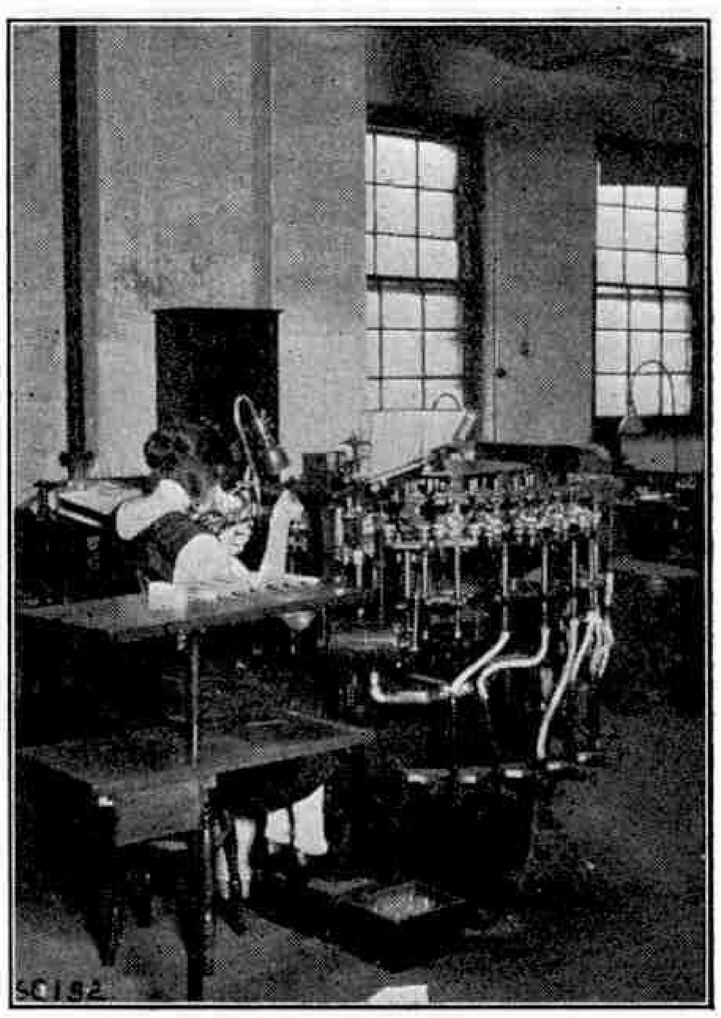
All bulbs, except those for unusual types of lamps, are now made by wonderful machines that reproduce mechanically the actions of a human glass-blower and blow perfect bulbs at a rate far exceeding that of even the most skilful workman. The "Westlake" machine shown in the accompanying illustration is installed at the works where the famous "Mazda" lamps are made. It has twelve "heads," each carrying two parallel revolving arms, both of which are fitted with mechanism for bulb-blowing; thus each complete revolution of the machine produces 24 bulbs. In normal operation the machine produces 55,000 good bulbs per day of 24 hours. In spite of this enormous output the machine requires only one operator.

The operation of the Westlake machine at the Mazda Lamp Works is briefly as follows. A pair of gathering arms, mounted high on the machine above each head, are made to plunge into an aperture in the furnace and, by means of vacuum suction, a definite quantity of molten glass is drawn up into blank moulds attached to the ends of the arms. The arms are then withdrawn from the furnace and the blank moulds then come into position immediately above two vertical arms, at the upper ends of which are mounted neck rings, or moulds, to which the glass is transferred by the opening of the blank moulds and the release of the vacuum. While this transfer is taking place the machine is revolving into the next position, so that the next pair of gathering arms are thrust into the furnace opening. The vertical arms just referred to can be rotated about their own longitudinal axis, and also can be rotated through 180 degrees about a pivot or trunnion fixed approximately halfway up the machine in such a position that after making the movement of 180 degrees the embryo bulbs are brought exactly into position for the finishing moulds to close round them. As the pair of arms swing downward, gravity, mechanical means and compressed air each take their turn in forming the molten blanks into the approximate shape of lamp bulbs. Finally, at the critical moment, wet moulds clamp over the bulbs and simultaneously compressed air is applied while the arms are rotating, causing the glass to be blown up close to the moulds and thus perfecting the shape of the bulbs.



Spherical Photometer in which a completed lamp is subjected to a "life test" to determine its light output or efficiency.

The moulds are then mechanically opened, and during further rotation of the machine the bulbs, now exposed to the air, are partially cooled. Eventually they are dropped off on to a moving conveyor that delivers them to another machine where excess glass from the neck is burned off by fierce gas jets. From the burn-off machine the bulbs drop on to another conveyor that carries them into a "lehr" or annealer, where they are raised to a high temperature and afterwards cooled gradually. This process has the effect of relieving the glass of all strain that may have been produced during the previous operations. Leaving the annealer at a temperature of from 300 degrees to 350 degrees C. the lamps pass along another conveyor and quickly become cool enough to be inspected individually before being passed as suitable for lamp-making. This is the first occasion upon which the bulbs are touched by hand.



Operator at work with one of the rotary stem-making machines.

Bulbs of a special form and bulbs of unusually large size, of which only small quantities are required, are still blown by hand.

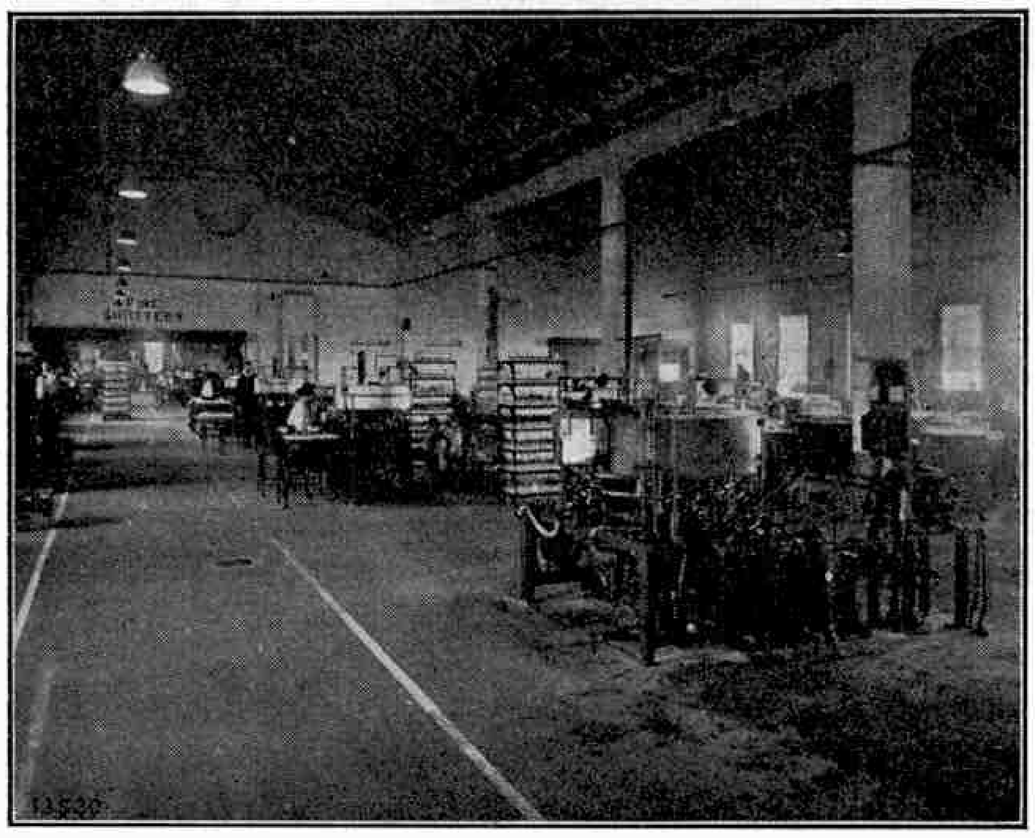
Large quantities of glass tubing and rod are used in the construction of electric lamps, and it is of the greatest importance that this material should be of good quality and uniformity. The range in size of tubing required for lamp-making is very wide and any diameter between 2 mm. and 15 mm. may be needed. Formerly the tubing was hand-drawn, and it was extremely difficult to work within the required limits of accuracy. This trouble has been entirely overcome by the use of the "Danner" tube-drawing machine, which is capable of drawing at speeds of from 200 ft. to 400 ft. per minute according to the nature and size of the tube. In this machine molten glass flows over a fireclay cylinder, through which air is blown, and is drawn from this over fire-proof rollers to a length of about 100 ft. By the time it has reached the far end of the machine the tube has cooled sufficiently to be cut into lengths of approximately 4 ft., and is then gauged and classified for wall thickness and external diameter. Glass rod is produced by a similar process, the important difference being that instead of the glass being drawn from a cylindrical former, a bullet-shaped former is used, and thus no hollow core is produced.

As was stated last month the filaments of electric lamps are now generally made of tungsten. The early tungsten lamps had filaments that were produced by mixing pure tungsten powder with some binding ingredient and squirting the mixture through fine dies, after which the binding material was burned off, leaving a slender but fragile tungsten filament. The squirting process has now been entirely superseded by the "drawn wire" method.

The high melting point of tungsten, 3,300°C., makes it impossible to follow the usual process for converting powdered metal into wire, that is by casting an ingot of the metal and afterwards rolling it and finally drawing it through dies. In the case of tungsten the pure powder, mixed with a minute quantity of thoria and other materials, is first pressed in a rectangular steel mould into bars about 16 in. in length and $\frac{1}{4}$ in. square by means of a hydraulic press working at from 10 to 20 tons per sq. in. The bar produced is very fragile, and after removal from the mould it is heated for a short time at 1,200°C. in hydrogen in order to make it strong enough to handle. The next operation, which is called "treating" or "sintering," consists of heating the tungsten bar, by means of an electric current, to a temperature of 3,000°C. in a continuous stream of hydrogen. During this process impurities that may have been present in the original powder are volatilised, leaving a tungsten bar having a coarse grained crystalline structure. This sintered bar is very fragile, and in order to prepare it for the subsequent drawing operations it is

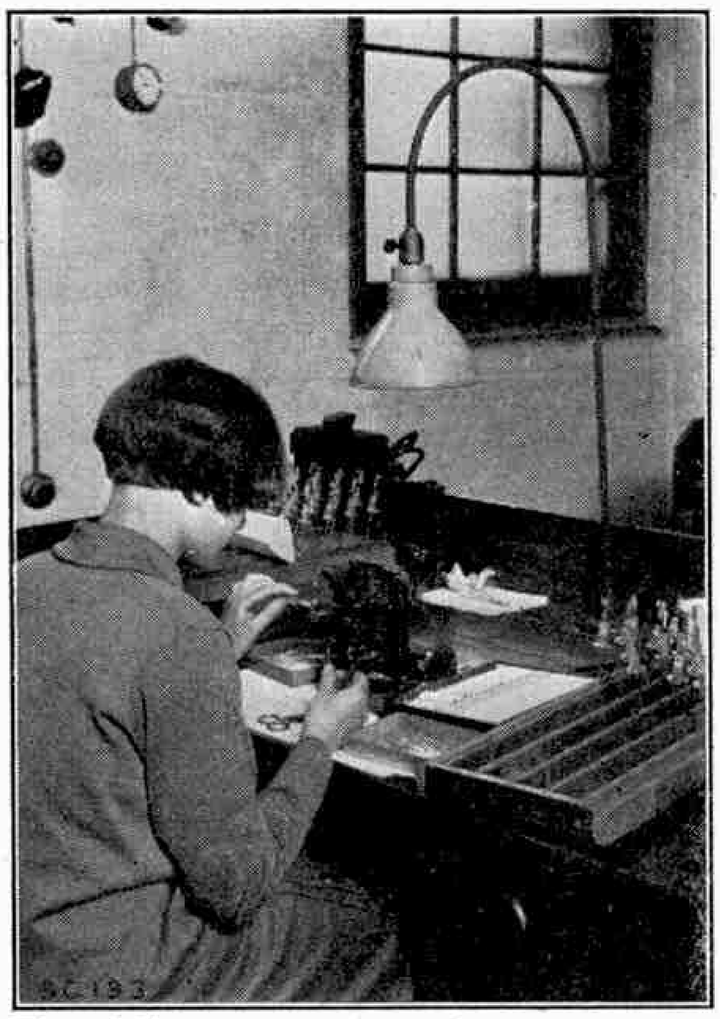
subjected, while hot, to a hammering process known as " swaging." The swaging is performed by pairs of grooved hammers, which are parted and brought together mechanically in such a manner as to strike blows at the rate of 100 per second upon the hot bar as it passes between them. This process causes the original crystals to be broken up and elongated, and the bar rapidly takes up a fibrous structure. A fully swaged bar is about 30 ft. in length and 1/30 of an inch in diameter, and at this stage may be regarded as wire, for it is quite flexible. This bar or wire is now drawn hot through a series of carefully gauged and polished diamond dies until the required diameter is reached, and the finished wire is sized and wound on to spools ready for mounting into the lamps. Well-made tungsten wire has a very high breaking strain of from 266 to 292 tons per sq. in. It is elastic, ductile and non-magnetic, and although it oxidises on the surface when heated to redness, it does not change at ordinary temperatures.

If we examine a Mazda electric lamp we shall see that the filament is carried by an arrangement of tiny wires projecting from an internal glass stem. This stem consists of a pair of welded leading-in wires, a cut length of glass " top tube," the " cane," and a piece of flared glass stem tube. The leading-in wires usually consist of three separate lengths of wire welded together. Copper wire is used to carry the current from the cap-contacts to the glass seal or " pinch " without overheating. Then comes a short length of platinum wire or some suitable substitute; and finally there is the conductor or lead wire inside the lamp on to which the end of the filament is clamped or welded; the metal usually used for this purpose being copper or constantan for vacuum lamps and nickel for lamps of the gas-filled type. The wires are electrically welded on an automatic machine that completes from 90 to 100 welded wires per minute, and in addition cuts the wires to the correct length and bends a small hook at the free end of each lower length of wire, in readiness for making the clamped joint to secure the filament.



" Exhausting " department, showing the rotary machines in which the lamps are brought into connection with a vacuum pumping system.

The component parts of the stem are placed in their relative positions on the head of a rotary stem machine, and held together by means of suitable chucks and holders. As the machine rotates, gas jets of increasing diameter melt the stem tube and the adjoining ends of the top tube and cane. During the rotation the ends of the glass stem tube in the region of the seal wires—that is the section of the wires that is to be embedded in the glass—comes under the influence of a soft gas flame, which gently warms the parts that come in contact with it. Further rotation carries the seal into hotter gas fires, which ultimately melt the stem tube and the adjacent ends of the top tube and cane together. The molten glass gathers round the sealwires and is finally squeezed tightly against the welds by means of mechanically-operated pincers, thus making a perfect metal-to-glass seal. The stem now has the top tube and the cane permanently sealed to the stem tube and in proper alignment with it. After this operation, the stem, with the seal still in a molten state, is carried into a position on the machine where a jet of air is projected directly down the centre of the top tube, and in this manner a small hole is blown in the centre of the stem seal. It is through this hole that the air is extracted from the vacuum lamp, and in the case of the gas-filled lamp through which gas is admitted.



The delicate operation of mounting the filament by hand.

The next step is to attach or " anchor " the filament supports, and this is carried out on one of several types of inserting machines. These machines all embody more or less the same principles of operation, which consist essentially of inserting the support wires into glass made soft in a gas flame. Then comes the process of mounting the filament. This is usually performed by hand, and is one of the very few operations that has not yet been mastered by the automatic machine. Mounting, as may be imagined, is a very delicate process, but an expert operator can mount successfully as many as 250 filaments per hour. As has already been stated, the leading-in wires are provided with a hook for the purpose of clamping the ends of the filament. Winding is carried out by first clamping the filament end to the first lead by means of powerful pliers, and then draping the wire on to the filament supports, finally making a complete circuit by attaching the other end of the filament to the second lead wire. The filament wire supplied to the operator is wound on a spool in a long continuous length, probably sufficient to mount 200 lamps. The pliers are therefore designed so that when the finally clamped joint is made on the mount and the wire is cut, the loose end is held in a special pair of jaws. Thus the end of the filament is always readily available for the operator, and this is essential if an economic rate of production is to be maintained. Hunting for the end of a wire with a diameter of from five to seven ten-thousandths of an inch would try the patience of most people, and filament wires of such diameters often have to be handled in the manufacture of 15-watt and 20-watt lamps of a voltage from 200 to 260. The filaments may be jointed to the leading-in wires by electrical spot-welding the joint or by the use of power pliers that embed the filaments into the lead wire. Whatever method be employed, the greatest precautions must be taken to ensure that a perfect electrical contact is made. The finished mount is sealed into the bulb by rotary machinery.

There now remains the exhaustion of the lamp, and this process also is carried out by a rotary machine. The lamp is placed on one of the heads of the machine, each head being connected independently to the moving element of a centrally mounted slide valve. Thus, as a lamp is conveyed round the machine it is brought into connection with the different parts, each having outlet on the underside of the fixed valve seating by means of piping that connects with the vacuum pumping system. The exhaustion is usually carried out in two stages, first by rough pumps, which reduces the whole system to a low pressure and finally by extremely efficient rotary oil pumps. A circular closed heater maintained at a temperature of about 350°F. is attached to the machine through which the lamps pass during exhaustion in order to evaporate all moisture that may be present, and also to assist the extraction of occluded gases that adhere to the interior glass surface and metal parts of the lamp. After exhaustion has been carried as far as is possible on the machine, the top tube is mechanically sealed and the lamp is liberated.

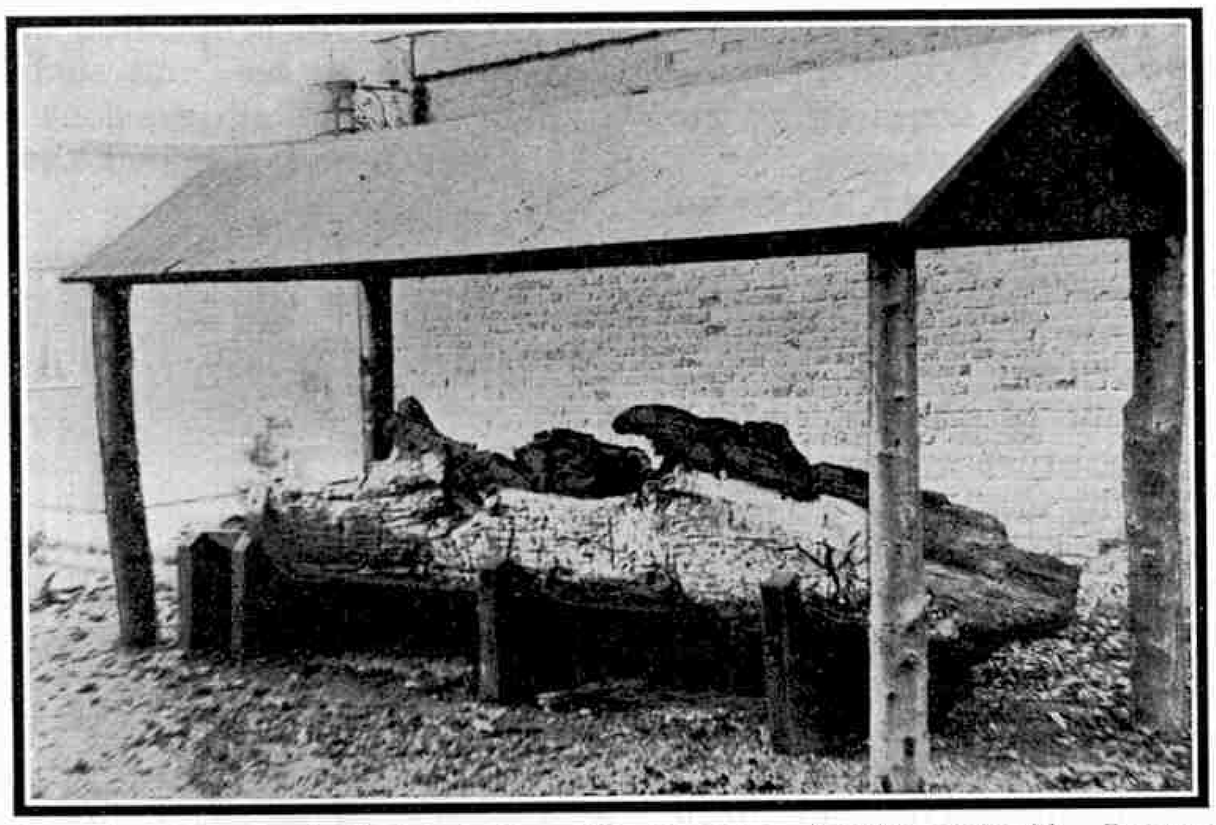
Finally the lamp goes through a process sometimes called " flash-ageing," the object of which is to get rid of all traces of residual gas. The process consists of burning the lamp at an overrun voltage in order to raise the temperature of the leads and the supporting wires. This heating, in conjunction with the low pressure that exists, causes the gas to be liberated into the bulb. One method of dealing with this gas is to introduce a small quantity of a substance such as red phosphorus into the lamp in the course of manufacture; and this substance when volatilised by the action of the hot filaments absorbs or combines with the gas forming a compound that subsequently condenses and is deposited on the inner surface of the bulb. This " flash-ageing " process is indispensable in the manufacture of high voltage vacuum lamps. The gasfilled lamp is handled on a similar machine to the one on which the vacuum lamp is exhausted. Air is first extracted by the pumps and subsequently gas is admitted to the lamp at a definite pressure, just before the top tube is automatically sealed off.

The completed lamp is now capped, cleaned and etched, and after passing final tests is ready for packing.

A Dug-out Boat of the Stone Age

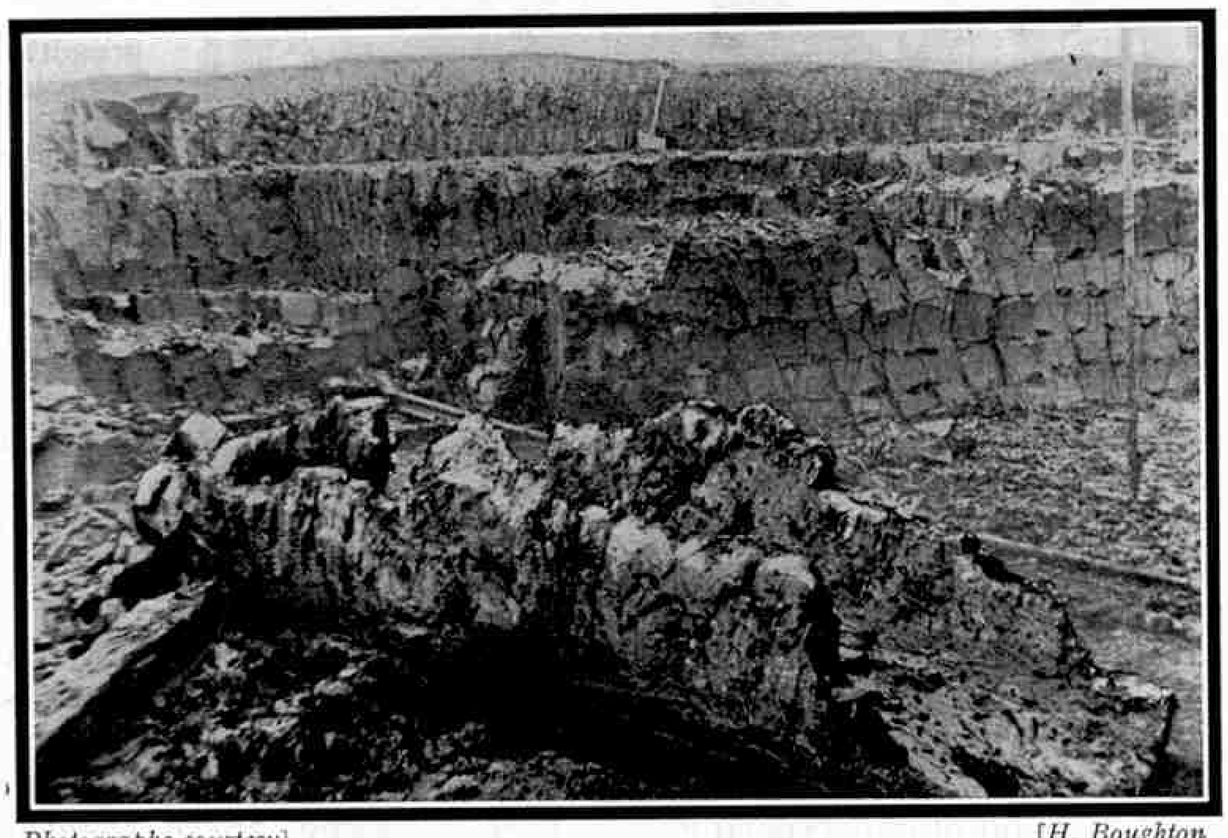
A DUG-OUT boat of primitive type, built probably in the Neolithic or later Stone Age, was unearthed a short time ago by workmen who were engaged in the task of digging for the valuable blue clay that is found at Murston Marsh, near Sittingbourne in Kent.

The boat is, as might be expected, a good deal the worse for wear. It has lost both its ends and is damaged in other ways, but sufficient of it remains to enable us to reconstruct its original appearance. It is about 10 ft. 6 ins. in length, 3 ft. in width, and 3 ft. 6 in. in depth. Along one side are holes, which were probably cut for the purpose of accommodating oars or paddles. It is a particularly interesting fact that, within a mile of the place where the boat was discovered, the late Mr. George Payne some years ago excavated an ancient British village, and brought to light many beautiful examples of flint weapons and tools. Archæologists believe that the boat must have been dug out of a whole tree trunk some 4,000 years ago with the aid of tools similar to those discovered a short distance away by Mr. Payne.



Remains of a boat that is believed to be some 4,000 years old. It was made by digging out the centre of a tree trunk.

A boat of this type appears crude to our eyes, but when we take into consideration that our ancestors had very little in the way of implements to help them, and that the only experience they had was gained as the result of experiment, we are bound to acknowledge that such a boat is at least a tribute to natural skill backed up by remarkable perseverance and patience. Very few of these prehistoric dug-outs have been discovered, but as a matter of fact it is really remarkable that any have been found at all, when we consider how long they have lain hidden in bogs and marshes. The few such boats that are in our museums to-day—the oldest of all, we believe, being in the museum at Hull—owe their preservation to the fact that they happened to be encased in some preservative substance, such as the blue clay that has protected the boat unearthed at Murston.



Photographs courtesy] [*H. Boughton*

The prehistoric dug-out boat in the blue clay at Sittingbourne, Kent, from which it was unearthed.

In thinking of the immense age of this boat one is tempted to speculate about it, and especially in regard to its builder. We may imagine some skin-clad Briton, his bare chest and arms smeared with woad, working hour after hour and day after day, hacking away at the tough tree with his flint tools until he had finished it to his liking. The launching of the boat would be a great occasion, not only to the builder, but probably to the whole of his little community or tribe.

Probably the boat had many years of useful life, spent in fishing, transporting her owner and his family from place to place, and perhaps now and then carrying a war party to an attack upon a neighbouring tribe. Finally she came to her last resting place in the blue clay. Perhaps she became waterlogged and useless; perhaps her owner died or was killed in battle. In any case, this unknown boat builder little thought that he was leaving behind him a relic that would endure for thousands of years.

In spite of the antiquity of the dug-out boat, it is certain that this was not the first type of craft in use by prehistoric man. It is most probable that the sight of a log floating down some stream or river first suggested the idea of water travel, and man's first adventure upon the waters would be astride such a log. The tendency of the log to roll over and precipitate its rider into the water would naturally suggest the advisability of improving it in some way, and gradually the idea would be evolved of hollowing out the log so that a man could sit inside it, instead of merely riding upon it.

Whether this idea was purely the result of a brilliant inspiration on the part of some specially intelligent man, or whether it was suggested by the sight of a log that was naturally hollowed out to some extent, we cannot tell. In any case the result was the same—prehistoric man had learnt how to make a real boat—and from this the giant liners of to-day have been developed.

Meccano in a School for the Blind

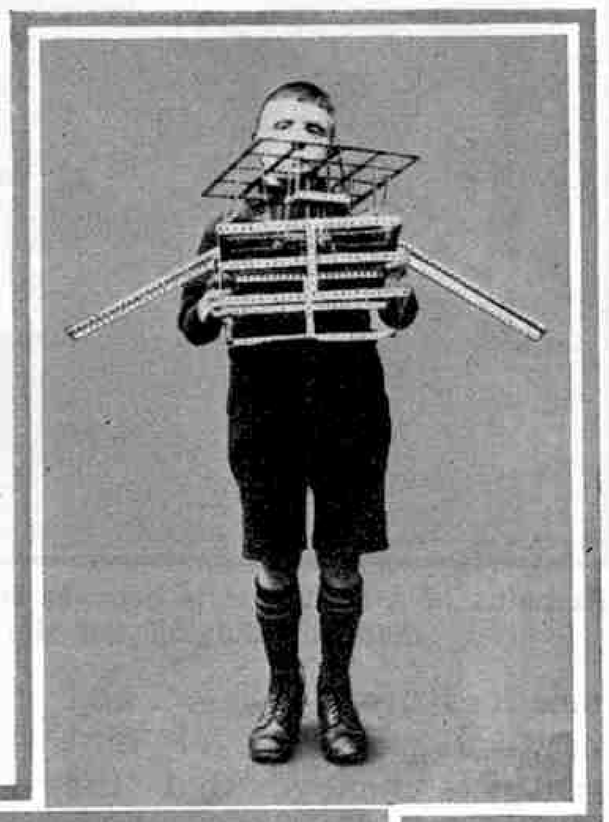
A New Joy in the Lives of Sightless Boys

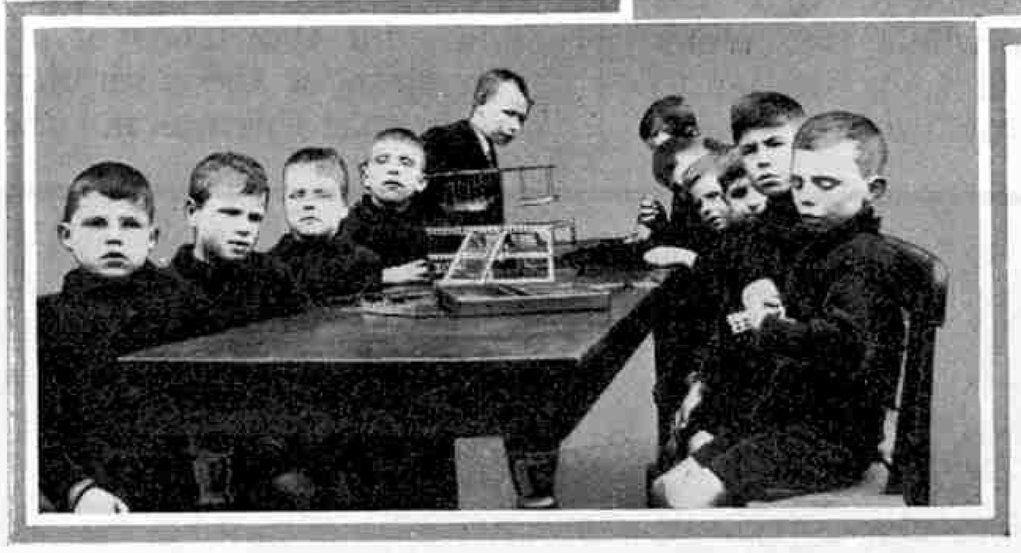
By R. Elton Laing, L.C.P., Headmaster, Yorkshire School for the Blind

ONE often hears people making the statement that the blind are "gifted" with an extraordinarily keen sense of touch. It is quite true that the majority of the blind do possess a tactile sense much more highly developed than that of sighted people, but it is by no means a "gift." It is acquired as the result of long and often very arduous training.

Handwork, in the greatest possible variety, forms an important part of the curriculum in all schools for the blind, and rightly so; for it is essential for the future of the pupils that their tactile sense should be as highly developed as possible. The delicate touch of the musician, or the heavier but no less highly-trained touch of the basket-maker, the brush-maker, or the mat-maker, is the result of carefully graduated exercises in hand and finger training. The teacher of the blind is for ever on the look-out for new appliances and methods that will assist in this training, and he gains a considerable amount of assistance in this direction by observing the blind during their play hours.

Some years ago I was greatly surprised at a request I received from one of my students. He had been awarded a prize for his school work, and he came to me to ask that this prize should take the form of a Meccano outfit! I am bound to confess that this request astonished me very greatly, and although I sympathised with it I was not by any means enthusiastic about it. I did not give a definite answer at the time, but told the boy I would think it over. I considered the matter very carefully from various points of view, and finally I decided to grant the request, and in due course the boy became the proud owner of a Meccano outfit.





Above—A good model proudly displayed. Left—A class listening to instruction from the teacher.

I had expected interesting results to follow this innovation, but what actually happened was a revelation to me. Every time I passed through the playroom, there was Jones—this is not his real name, by the way—with his Meccano outfit, surrounded by a crowd of admirers, all keenly interested and anxious to assist, even in the smallest degree, in the construction of some model. Many a time have I stayed to listen to an argument as to the correct method of constructing, say, a crane or a truck. Those who had "seen"—and it must be remembered that all blind boys talk of "seeing" things—the prototypes of these models in real life were the ones to wax most eloquent on the details of the model.

Perhaps readers may wonder how it comes about that blind boys know the shapes of things. This knowledge is acquired largely by the handling of models, with which all schools for the blind are amply provided; or by the tracing of designs in raised dots that appear in some of the books and magazines specially printed for the blind. In addition it should be remembered that a certain proportion of the boys have at one time been able to see, and such boys seldom, if ever, lose their sighted impressions.

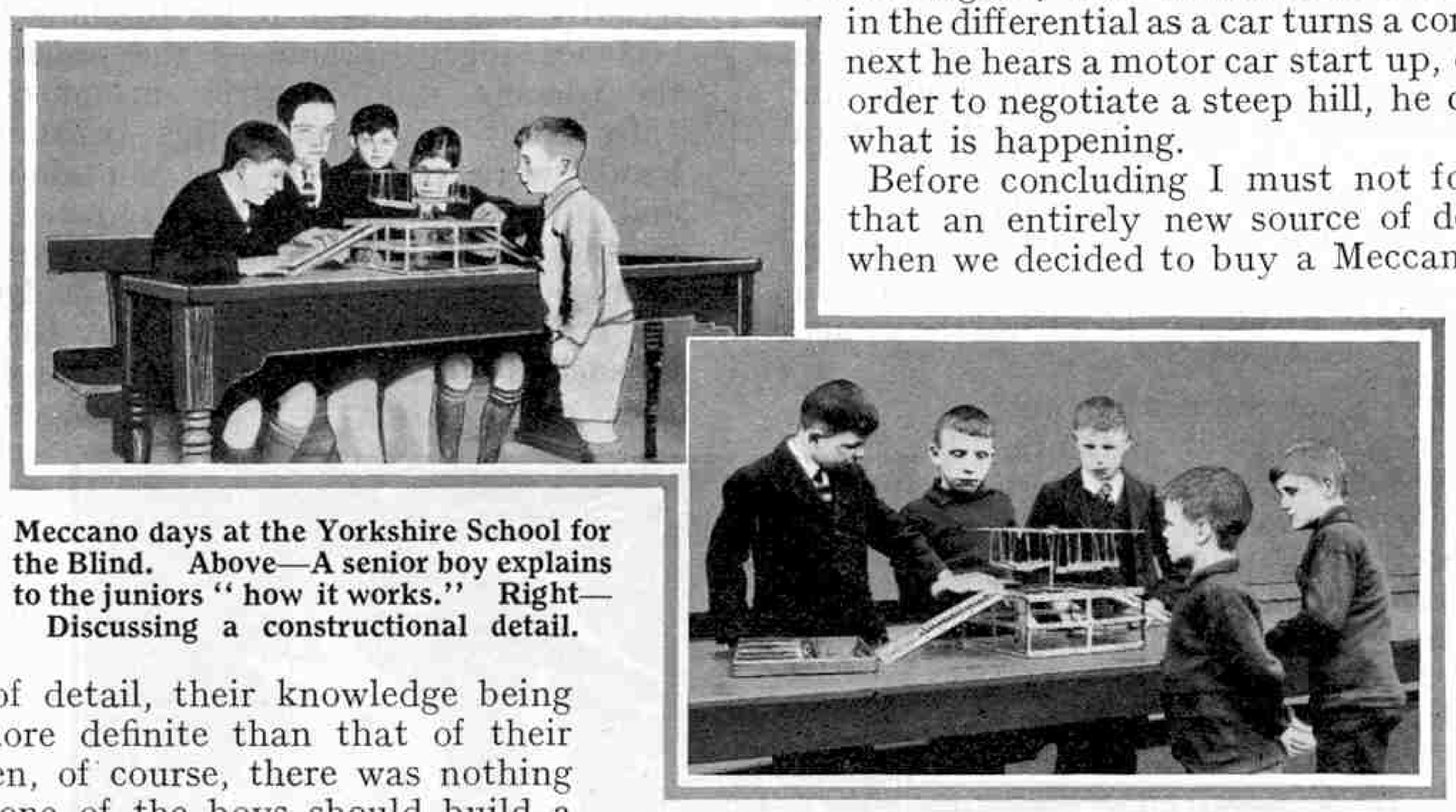
After I had watched the boys for several days the thought suddenly struck me—"Why not utilise Meccano in school?" We have models of various things at the school, but however well we may be supplied there is a limit to the number of these models, especially the larger and more elaborate ones, which naturally are costly. I thought the matter over for some time and then came to the conclusion that Meccano, whatever might be its value from the model point of view, would certainly provide an excellent finger-training system. Among other things it would develop manual dexterity, discrimination in touch, a sense of spacial values, and last, but by no means least, an inventive faculty. All these things are of inestimable value in the training of the blind, and so I decided there and then to purchase one of the larger Meccano outfits for school use, and to test its efficacy thoroughly.

With the advent of a No. 5 Outfit enthusiasm ran high. Of course every boy wanted to use it at once, but this was obviously impossible. In order to get over this difficulty a favoured few were selected to sit round a long table and receive instruction in the use of the various parts. Nuts and bolts were handed round for inspection, and deft fingers were soon at work learning how to screw these together quickly and accurately. The various parts were carefully inspected by each pupil in turn, and their shapes and lengths committed to memory. The pupils very quickly devised a method of asking for specified parts. For instance, a $1\frac{1}{2}$ in. strip has three perforations, and therefore they asked for a "three"; a $2\frac{1}{2}$ in. strip has five perforations, so they asked for a "five"; and so on.

After this preliminary examination progress became rapid, and small models were made and handed round

for general inspection. Those boys who at one time had had sight were able to recognise instantly such models as an aeroplane, a tramcar, a wheelbarrow, or a bridge. With boys who had been blind from birth it was a different matter. They were just as keenly interested, but they had to be taught the intricacies of shape and construction. This in itself was of great educational benefit, for they were continually learning shapes and forms which, until then, had been unknown to them. These were committed to memory, and once a blind boy has memorised a shape he seldom or never forgets its essential features.

This training was valuable in the handwork class and the results were very gratifying; but I soon found that the utility of Meccano did not cease there. For instance, when a geography lesson came round and Holland and its windmills formed the subject, it was found that certain boys who had constructed a windmill in the handwork class were able to describe it with great accuracy of detail, their knowledge being obviously far more definite than that of their classmates. Then, of course, there was nothing for it but that one of the boys should build a model so that every member of the class could be equally enlightened. On another occasion a boy made a small model of a canal lock, which proved to be of the greatest assistance to the teacher when he came to give a lesson on canals. The same sort of thing occurred in history lessons. Repeatedly some little point cropped up upon the accurate understanding of which depended largely the success of the lesson. In a large proportion of such cases Meccano came to the rescue and, aided by a little judicious use of the imagination, solved the problem completely. Sometimes the Meccano illustrations were of the simplest possible nature; at other times really elaborate models were constructed. Among the latter I remember particularly a model of a medieval castle, complete with drawbridge and portcullis, which aroused keen interest and great enthusiasm.



Meccano days at the Yorkshire School for the Blind. Above—A senior boy explains to the juniors "how it works." Right—Discussing a constructional detail.

The possibilities of Meccano for giving blind boys some conception of the famous engineering structures of the world are almost unlimited. Even to a boy who possesses sight, and who therefore is able to examine photographs of such giant structures as the Forth Bridge or the Quebec Bridge, a Meccano model is of great value in explaining the engineering principles involved, and the manner in which the component parts combine together to resist stresses and strains and so provide the necessary strength. To a blind boy the value of such a model is infinitely greater. By handling the miniature representation he gains an accurate idea of how it is built up, and thus he is enabled to form a mental conception of the actual structure that he could not acquire by any other means.

In the same way Meccano models of the various standard mechanisms enable a blind boy to grasp the working principles of engines and machinery of all kinds, giving him clear and definite knowledge in place of the vague general impressions that so often are the only result of descriptions. For example, it is difficult to convey, by description, a true conception of a motor car to a boy who has been blind from birth. If, however, Meccano models of a motor car gear-box, differential gear, steering mechanism, etc., are placed before him, so that he can handle each unit separately and follow by the sense of touch its incorporation in the chassis, he can gradually build up a mental picture of the complete car. He can actually feel the difference in the drive obtained by changing the gears in the gear-box; he can feel the clutch gradually take up the drive from the engine; and he can note exactly what happens in the differential as a car turns a corner. Then, when next he hears a motor car start up, or change gear in order to negotiate a steep hill, he can visualise just what is happening.

Before concluding I must not forget to mention that an entirely new source of delight was found when we decided to buy a Meccano electric motor. A model worked by hand is all very well, but it never completely satisfies a boy. With the addition of a motor came that touch of realism in which the youthful mind takes so keen a delight. At once the model was lifted from the idea of being a plaything to something approaching reality. I suppose we all have experienced at some time the thrill of delight that we express in two words—"It works!"

One afternoon per week is now set aside for the use of Meccano and the making of models to be employed in some of the lessons that will fall due in the following week. This afternoon has come to be called "Meccano afternoon," and I think I am right in saying that it is the busiest and happiest afternoon of the whole week. The whir of the motor is a never-ending source of delight to the younger boys, and excitement runs high when the eager hands have brought a model to completion, and, by means of the motor, set it to work just like the real thing. The effect brought about by the motor is indeed surprising. No matter how ingeniously designed and cleverly constructed a model may be, so long as it is not working it remains just a model—interesting and greatly to be admired, of course, but still a model. As soon as the motor gets to work, however, the model springs to life and takes on an entirely new interest.

It seems to me that the possibilities for the application of Meccano as an educational factor are practically inexhaustible, and my only wonder is that more use is not made of it in "sighted" schools. At any rate I am now thoroughly convinced that it is indispensable for the teaching of the blind along practical and at the same time interesting lines.

Nowadays, when our school prize day comes round and I ask what sort of prize the winner would like, the answer in very many cases is certain to be—"A Meccano Outfit, please, sir."

FROM OUR READERS

These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

Photographing an Angry Curlew

When I discovered the nest of a curlew I immediately decided to obtain a photograph of it for inclusion in my collection. Near it I erected my hide, a green tent just large enough to hold myself and my camera, and covered this with heather in order to give it a natural appearance.

I did not return to the nest until two days later and on my approach the bird ran off her eggs and flew away with loud protests. As soon as she was out of sight I scrambled into my hide and focussed the camera on the nest.

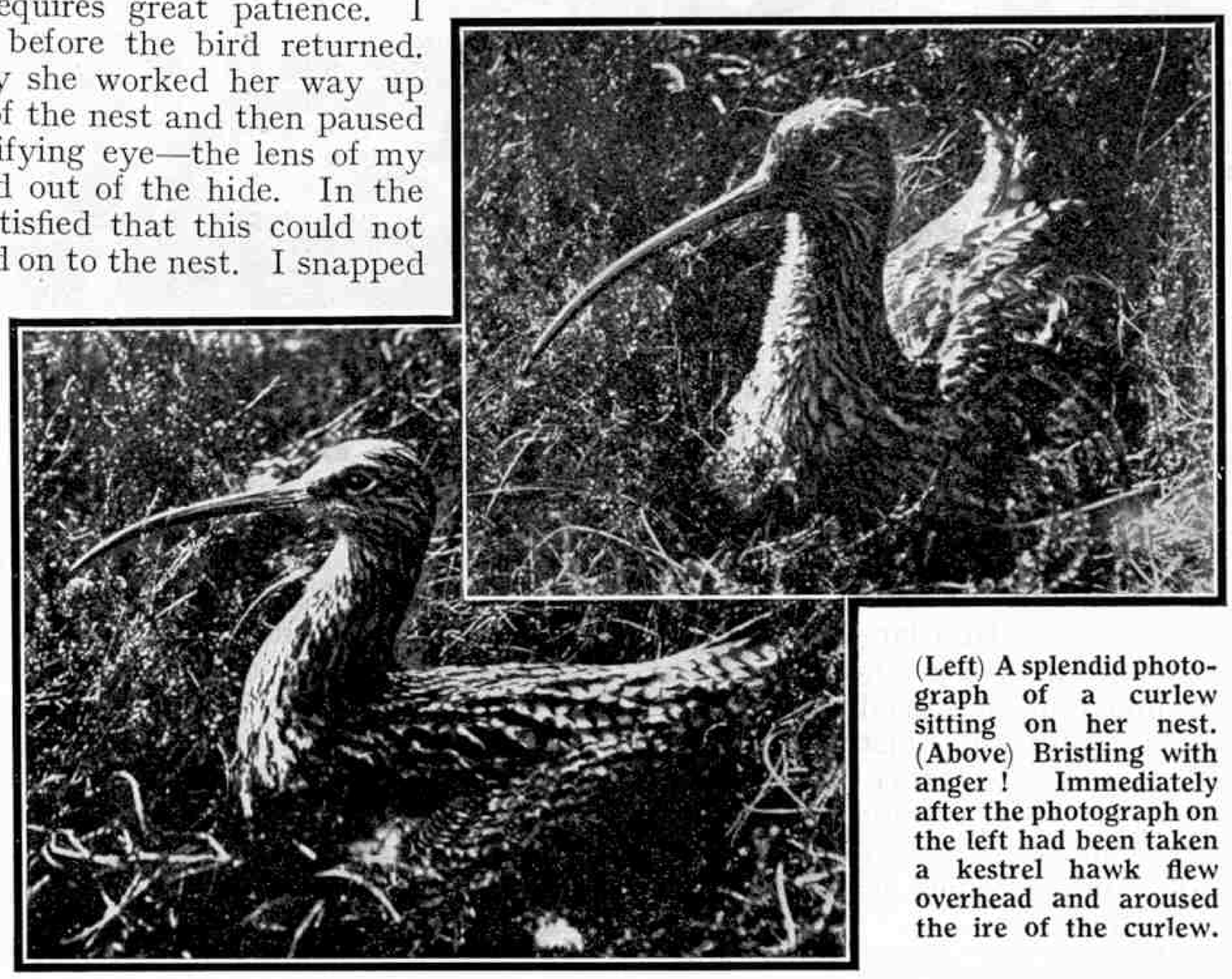
Bird photography is an interesting hobby, but is one that requires great patience. I waited a long time before the bird returned. Slowly and carefully she worked her way up to within ten yards of the nest and then paused to examine the terrifying eye—the lens of my camera—that looked out of the hide. In the end she became satisfied that this could not hurt her and wriggled on to the nest. I snapped the trigger and secured what turned out to be an excellent photograph.

A very interesting experience followed. I had scarcely taken the photograph when I heard the cry of the bird's mate in the distance. As the sound came nearer she looked up into the sky and suddenly ruffled up her feathers. With a sharp cry of anger she leaped from the nest and disappeared, but in the meantime I had secured a photograph that was even more interesting than the one I had already obtained.

I could not understand why the bird had behaved in this manner until a friend who accompanied me came to relieve me. He told me that a kestrel hawk had flown overhead. The cry of the male bird had been an alarm signal, and the two curlews had united in vigorous and noisy efforts to drive the dreaded intruder away.

As my photographs reproduced show, the most remarkable feature of the curlew is its bill which is from five to seven inches in length. Its plumage is streaked and mottled dark brown and the bird is not easily seen when sitting on its nest.

W. H. JOHNSTON (Durham).



(Left) A splendid photograph of a curlew sitting on her nest. (Above) Bristling with anger! Immediately after the photograph on the left had been taken a kestrel hawk flew overhead and aroused the ire of the curlew.

Anger Measured Electrically

In my Science class at school an interesting experiment recently was made in order to show that when a boy becomes angry or amused the resistance he offers to the passage of an electric current changes.

In order to measure this resistance the victim's hands were placed in jars containing salt solution, and into these also were introduced wires connected to the resistance-measuring apparatus. This was arranged on the Wheatstone Bridge principle, the boy's resistance being balanced by that of coils of wire in such a manner that no current flowed through a galvanometer placed at a certain point in the circuit. A Leclanche cell was used to supply the current.

When the galvanometer handle pointed to zero and the victim was sitting quietly with his hands in the salt solution, he was struck sharply on the back of the neck. Two or three seconds later the needle of the galvanometer moved to one side, showing that the boy's resistance to the passage of the electric current had changed, thus upsetting the balance and causing current to flow through the instrument. Next he was made to laugh, and afterward he was annoyed in many ingenious ways, in every case with the result that within a few seconds the needle of the galvanometer moved away from the zero mark.

Those who repeat this experiment should take care to have good contact between wires and terminals, and the galvanometer employed must be sensitive.

A method similar to that followed in this experiment is said to be used by the police in certain American towns in order to detect whether witnesses examined by them are telling the truth. Apparently to tell a lie requires some emotional effort. This may not be visible, but is readily detected by electric means!

J. E. LONSDALE (Battersea).

A Trip on a Dundee Trawler

Last Spring I accompanied the crew of a trawler which left Dundee to fish in a small bank about 30 miles off St. Abbs Head. On arrival a "dan" was set. This is a small moored buoy, marked by day with a flag and at night with a lantern, round which the trawler works when fishing.

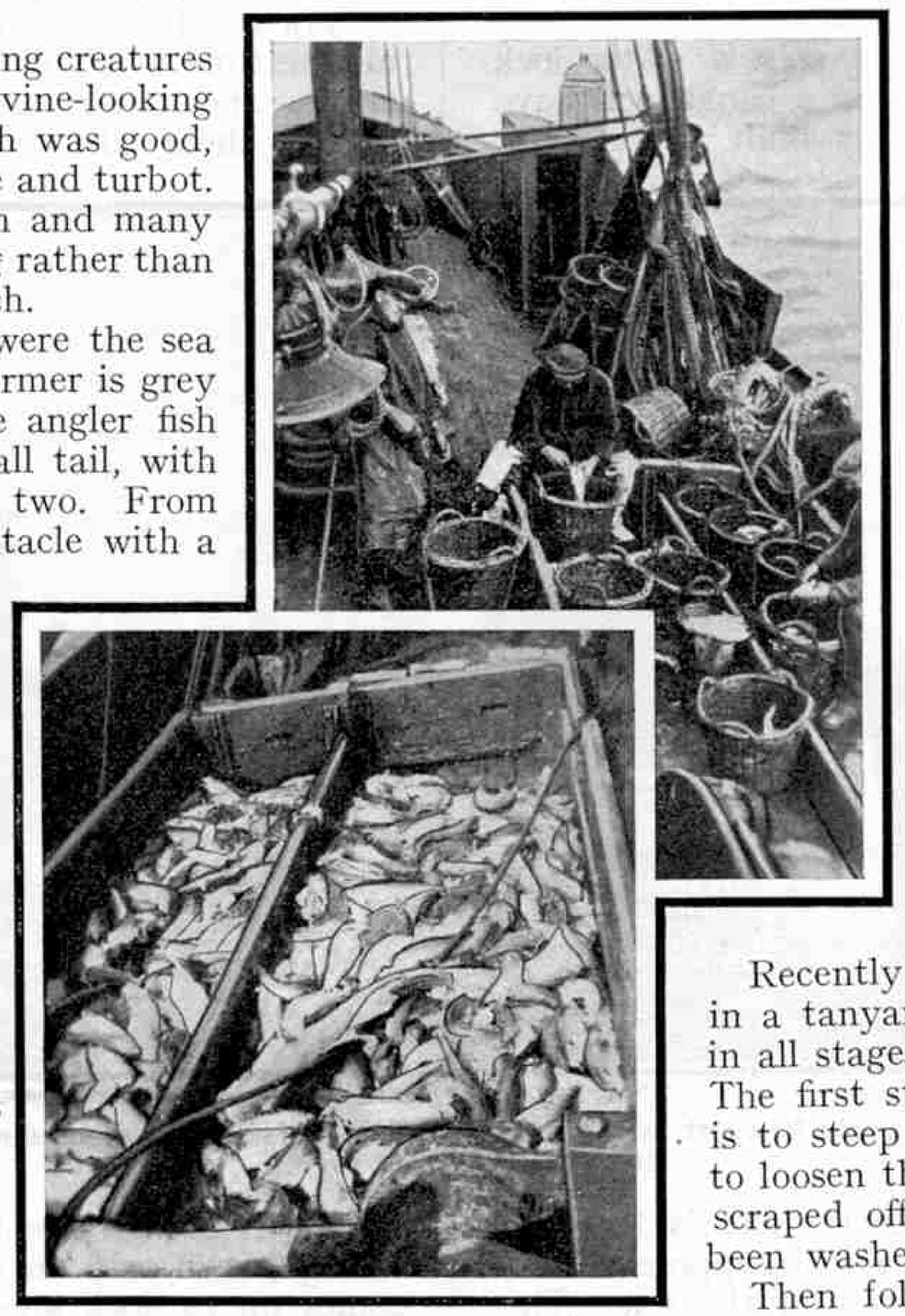
The fishing gear was then shot, and the long bag-shaped trawl dragged along the bottom of the sea by means of wire hawser. Every three hours the gear was lifted and the fish caught in it were dropped into the "pond," a receptacle on deck, in which they were sorted.

Among the wriggling and gasping creatures in the wooden enclosure were bovine-looking cod, haddock and, when the catch was good, a number of flat fish such as sole and turbot. Sea urchins, star fish, cuttle fish and many other varieties that are interesting rather than useful were included in the catch.

The ugliest fish in the pond were the sea bat and the angler fish. The former is grey and has small beady eyes. The angler fish has an enormous head and a small tail, with practically no body between the two. From the back of its head rises a tentacle with a phosphorescent bulb on its end. The fish lives up to its name by lying at the bottom of the sea waving the bulb about in order to attract the smaller fish on which it feeds.

From the pond the fish were transferred to the hold after cleaning and separating, ice being packed in with them. When the hold was full the gear was shipped and after picking up our dan we turned homewards. The return voyage was made at night and I saw something of the wonderful lighting system on the east coast. Three first class lighthouses were passed, including the one erected on the notorious Bell Rock. Since this was first lighted in 1811 it has not failed for a single night to act as a warning of the existence of the dangerous reef on which it stands.

R. B. ROBERTSON (Dundee).



Scenes on board a Dundee trawler. In the upper photograph members of the crew are seen cleaning and separating the fish, and below, a good haul is shown in the "pond."

Quaint South African Pillar Boxes

The brightly coloured letter boxes familiar to many readers of the Magazine are not used in thinly-populated farming districts of South Africa. In their place paraffin boxes or tins, tea boxes, crates and all kinds of containers are placed on posts along the routes followed by the rural postmen, who cannot possibly visit every outlying farm in order to collect or deliver letters. In many instances a single box serves the purposes of the people of a group of farms, those interested taking turns to visit it at post time and to distribute its contents.

In one part of Namaqualand the old system of "post office stones" is yet employed. Prospectors and travellers roving about this wild region usually return at intervals to well-known points. Companions working nearer the postal agencies bring mail for them and leave it in cavities under marked stones at these points.

In some outlying districts farmers also make use of stones as post offices. These usually are marked with circles, crosses or crude squares enclosing initials in order to indicate their ownership. The stones occasionally are chiselled, but paint or tar offer easier means of giving them identification marks.

The hollow trunk of a dead tree, a bird's nest, and the skull of a buffalo are other instances of remarkable South African letter boxes. The bird's nest was the roofed home built by a hammerkop bird. It was three feet in height and, although made of mud reinforced by sticks and stones, it was so well built that it was water-tight.

The most striking of these quaint letter boxes perhaps was a buffalo skull. The jaws of this were fixed in position to allow a letter of average size to pass between them and a few adjustments at the back enabled the originator of the idea to make it the letter box of the hunting party with which he was travelling. It was quite unmistakable even in the dark, and in that camp no letters ever were posted in the wrong place!

W. L. SPEIGHT (Cape Town).

How Hides are Tanned

Recently I spent a very interesting time in a tanyard in Surrey, where I saw hides in all stages of their conversion into leather. The first step in the manufacturing process is to steep the raw hides in lime in order to loosen the hair and flesh, which are later scraped off after the lime in the hides has been washed out.

Then follows the actual tanning process. The best part of the hide, usually called the "butt," is placed in a pit containing a weak tanning liquor. After remaining in this for a day the butts are transferred to one containing a slightly more concentrated solution. Immersion for a similar length of time in a yet stronger liquor follows, and this process is continued. In the final tanning solution they remain from 9 to 12 months.

Great care must be taken when the butts are being introduced into the tanning liquors, for at that stage they are very delicate and easily ruined. In the yard I visited the principal agent used in the preparation of liquor is the bark of English oak, the best of which is obtained from trees grown in Surrey, Sussex, and Hampshire. A certain proportion of valonia is added.

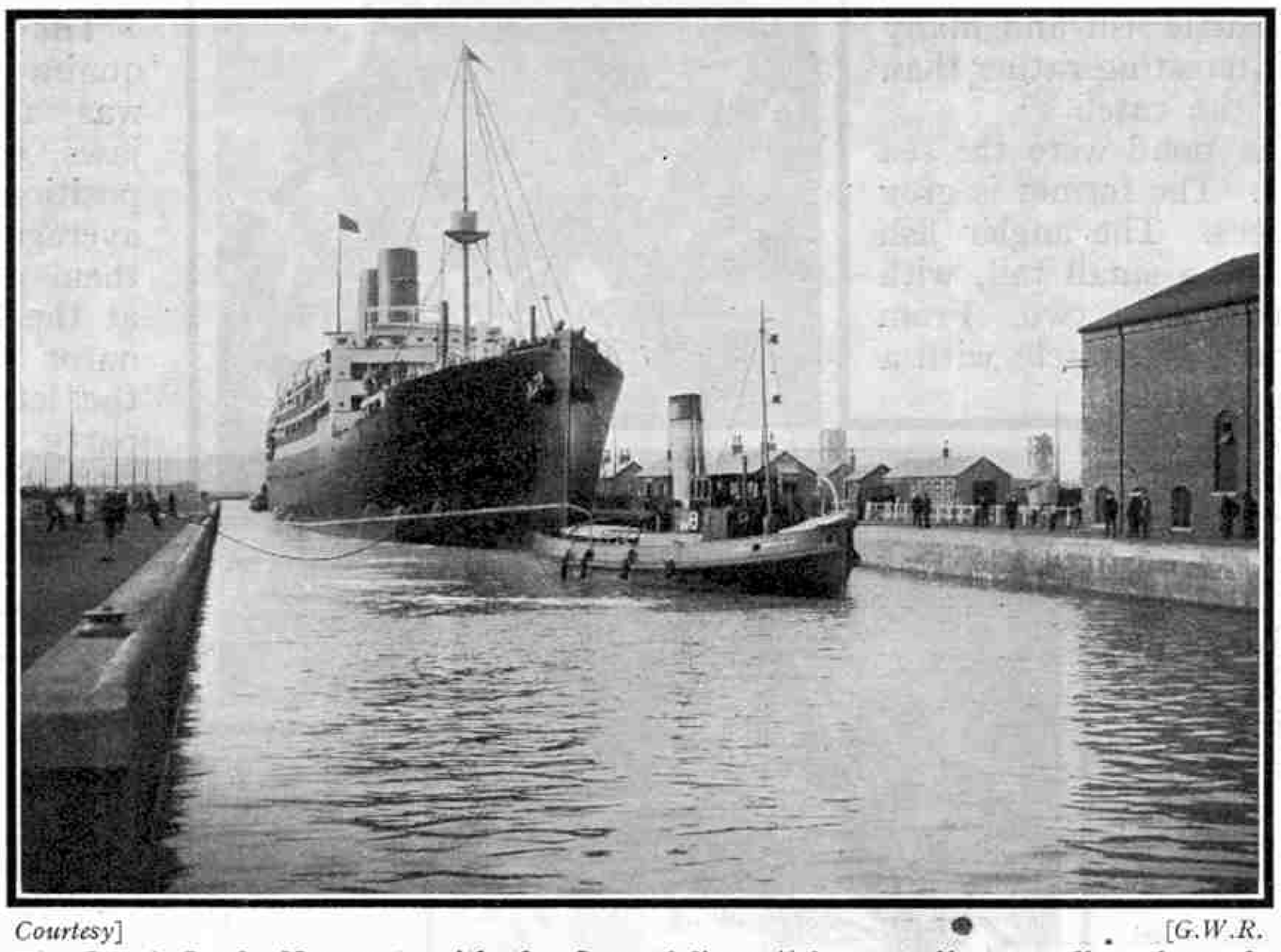
When tanning has been completed the butts are sorted and hung up in such a manner that air can pass completely round them. The temperature of the rooms in which they are stored is carefully regulated, for if they were to dry too quickly or two slowly they would be ruined. Oiling and rolling then gives the leather a good finish, after which the pieces are further dried in a warm atmosphere. K. G. TAYLOR (Putney, S.W.15).

One of the World's Largest Sea Locks

The G.W.R. South Lock at Newport, Mon.

ONE of the largest sea locks in the world is to be found at the head of the Bristol Channel. This is the South Lock at Newport, Mon., and it gives entrance to the Alexandra Docks.

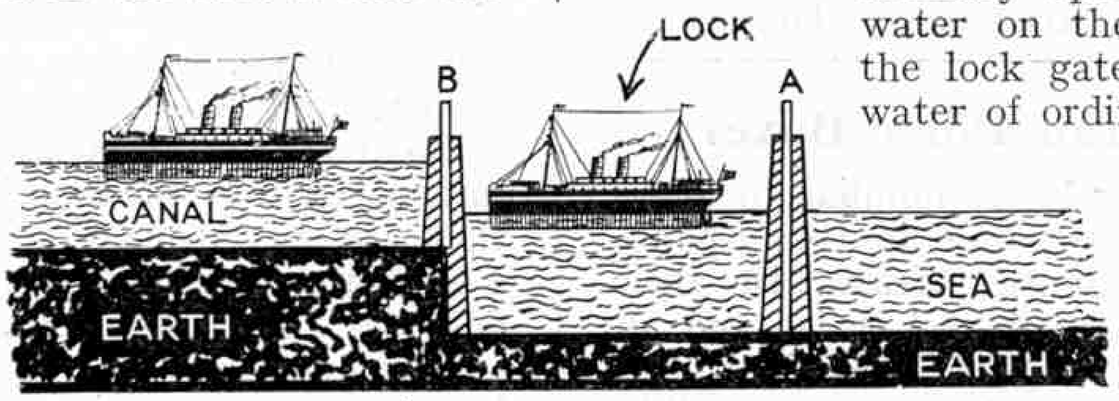
Those of our readers who have seen a water lock in operation, if only a small one on a canal, will have noticed that, although the lock is built in brick or stone, it is really a piece of machinery. It is an intermediate chamber—or tank of water so to speak—placed between two areas of water that are on different levels, and communicating with both these areas by lock-gates at each end. The method of operation will be more easily understood if we follow the accompanying diagram; and for the purpose of this illustration we are assuming that the two areas of water at different levels are the sea and a canal.



Courtesy [G.W.R.

The South Lock, Newport, with the Cunard liner "*Ascania*" proceeding through it on her way out to sea.

The space between A and B represents the lock. To the right of the lock there is the sea, and to the left a canal; and we will suppose that a vessel wishes to enter the canal from the sea. The lock-gate at A is opened, and the vessel is steered into the lock. When this has been done, lock-gate A is closed and water from the canal is allowed to flow slowly into the lock by means of valves, known as sluices. As the water rises in the lock it lifts the vessel, and continues to do so until the water reaches the level of the canal. Lock-gate B is now thrown open and the vessel enters the canal.



When a vessel enters the sea from the canal the process is reversed. The lock is filled with water to the level of the canal, lock-gate B is opened, and the vessel enters the lock. Lock-gate B is then closed, and the water in the lock is allowed to flow slowly out until it reaches sea-level. Gate A is now opened and the vessel passes out to sea.

Where the lock-gates and the sluices are worked by hand, and the vessels dealt with are only small, this cycle of operations is a comparatively simple matter; but it becomes a serious engineering problem when large ocean-going vessels have to be handled.

The water in all enclosed docks must be kept always at practically the same level, so that vessels may be all the time in about the same relative position to the cranes and other quayside appliances that load and unload them. In order to maintain this even level there must be lock entrances to keep the water in the docks free from the fluctuations in height caused by the tides outside. Thus we see how necessary it is to have the great entrance locks that are provided to the docks at all our main harbours. At Newport the necessity is particularly striking, because the rise and fall of the tide actually ranges through about 40 ft. That is to say, while there is about 45 ft. depth of water in the entrance channel when the tide is high, there is only a depth of about 4 ft. at low tide. Although the tides in the Bristol Channel are so high, it is only on very rare occasions that the tide comes up to dock level at Newport, and thus permits all the dock gates to be opened together, so that vessels can pass straight in or out.

The depth of water in the lock is indicated by a vertical scale on the dock wall. At high water of ordinary spring tides there is 45 ft. of water on the "cill," or floor on which the lock gates rest; and 35 ft. at high water of ordinary neap tides. Even large cargo vessels do not as a rule draw more than 30 ft. of water, so that a good margin is provided.

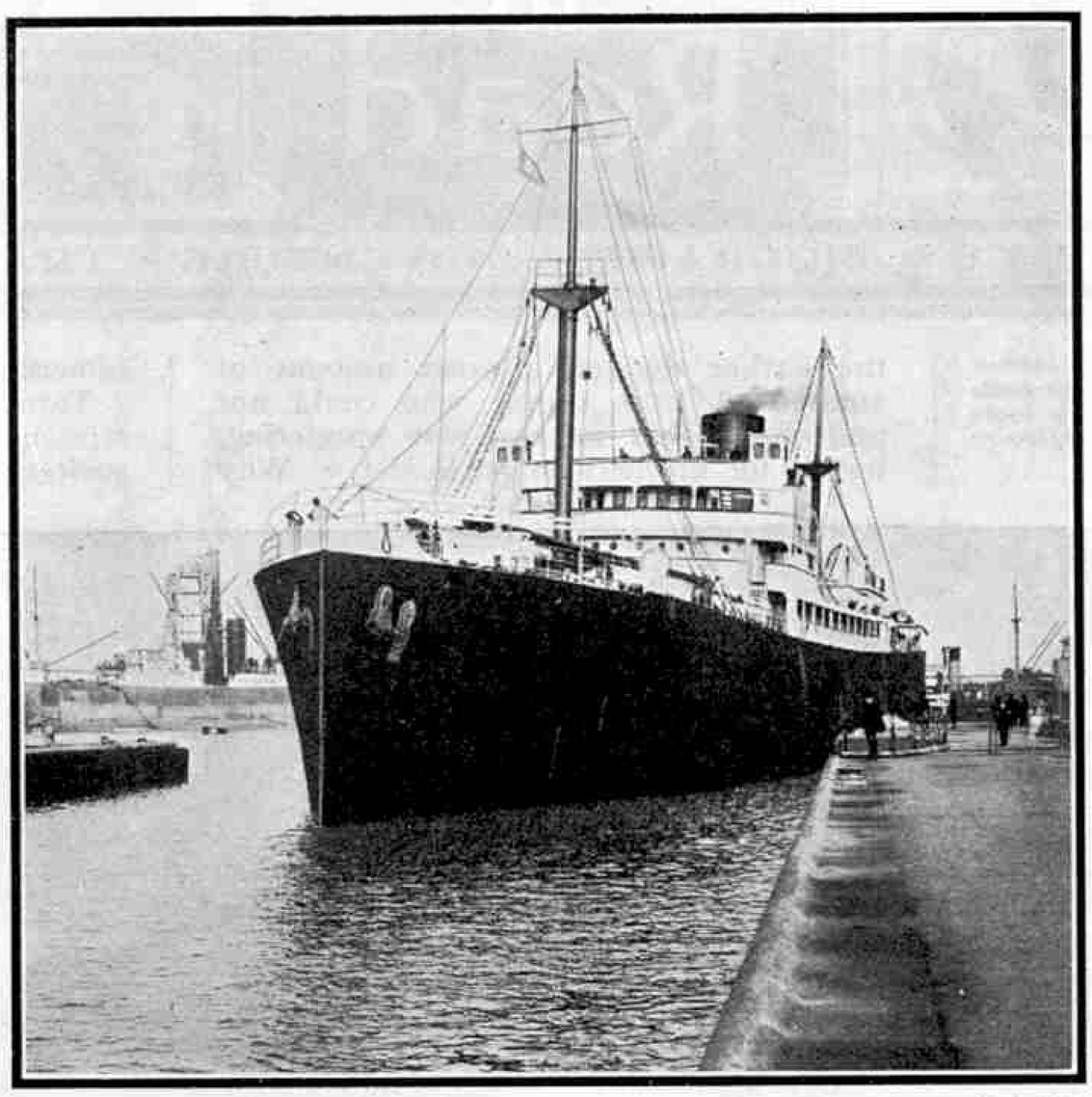
This Newport entrance lock connects the Bristol Channel with the Alexandra South Dock, and is 1,000 ft. in length and 100 ft. in width. In addition to the inner gates at the dock end and the outer gates at the sea end, there is a pair of intermediate gates to enable the lock to be divided into two sections; the section nearer the sea being 400 ft. in length and the one nearer the dock 600 ft. in length. When full the lock contains about 30,000,000 gallons of water. The operation of the lock causes a

considerable quantity of water to flow from the docks into the Bristol Channel, and a corresponding quantity has to be restored to the docks from the Channel by pumping. This task is performed by two huge steam pumps installed in a power-house near the lock. These pumps are each capable of pumping nearly 6,000,000 gallons of water per hour. The pipes through which they send the water are 12 ft. in diameter, or of about the same dimensions as the "tubes" in which the trains run on the London Underground Railways.

An impression of the size of the South Lock is given by the accompanying illustration showing the Cunarder "*Ascania*" proceeding through it to sea. This vessel is 519 ft. in length, 65 ft. in breadth and of 14,000 gross tons.

A serious disaster occurred in 1909 while the lock was being constructed. A trench, 100 ft. in length, 50 ft. in width, and 60 ft. in depth, had been dug for one of the outer walls of the lock, and the sides of the trench were supported by timber piles and cross pieces. One afternoon, shortly before the men ceased work, the timber supports collapsed. Cranes, lines, and wagons crashed down into the trench, and some 40 men lost their lives.

The lock was opened by the Duke of Connaught on 14th July, 1914, that is to say only about a fortnight or so before the outbreak of the Great War. From a national point of view the dock was extremely useful during the period of hostilities. Generally speaking, the west coast of England was much safer than the east coast, and many large vessels that brought their cargoes to Newport or loaded them there in comparative safety could not have been dealt with if the lock had not been in existence.



Courtesy [*G.W.R.*

A large vessel entering the South Lock, Newport, from the South Dock.

The original Newport Dock now known as Town Dock, is about five acres in extent and was opened in 1842. The lock entrance to the dock is 220 ft. long, 61 ft. wide, and its capacity is only one-eleventh that of the huge South Lock. This old Town Dock is to be closed shortly.

A channel establishes communication between the South Dock and the North Dock that was opened in 1875 by the Alexandra (Newport) Dock Company. The South and North Docks thus form one sheet of water of about 125 acres. The Alexandra Company had been formed 10 years before, and the improved facilities that the North Dock provided led to keen competition between them and the original Newport Dock Company, who owned the Town Dock. An effort to get as much traffic as possible into the Town Dock resulted one day during 1882 in two vessels becoming jammed in the lock entrance, so that the gates could not be shut and the water ebbed away with the tide. This disaster proved the undoing of the old company, and within a year they sold their dock to the Alexandra (Newport and South Wales) Docks and Railway Company. After 1921 the docks became part of the Great Western Railway as a result of the Railways Act of that year.

Giant American Airships—

(*Continued from page 601*)

these in turn being carried on concrete piles driven through the soil to rest on solid rock. Probably the most remarkable feature of the giant hangar is the method adopted in building the doors. Imagine that the peel of half an orange is divided into four equal segments. Each of these would then resemble in shape one of the two leaves of the doors fitted at each end of the dock. Each of the four gigantic leaves weighs about 600 tons. They are fastened or hinged at the highest points by means of enormous forged pins, and each rests on 20 wheels running on rails, on which it may be rolled out of the way when an airship is to be taken into the shed or brought out.

The gear that is employed to move the doors is driven by means of a 125 h.p. electric motor, and electric cut-out switches automatically stop the motor as the two leaves of the door come together when closing, or reach the extreme open position when access to the shed is desired.

The motor is of a very interesting character, for it may be used at two speeds with a constant torque effect. The change from the higher speed of travel of the doors—40 feet per minute—to the lower one, which is only 20 feet per minute, is brought about automatically by means of cut-out switches mounted on the runway. These are operated by projections from the doors.

In order to open or close one end of the shed, all that is necessary is to press the button that brings the motor and high-speed gear into action. The door moves at full speed until the first slow-down switch is encountered. The rate of travel then decreases to half. Eventually contact is made with the switch, already referred to, that stops the motor.

Some of the helium needed for the airships will arrive at Akron in steel bottles four feet in length and two feet in diameter. Each of these contains about 170 c. ft. of gas, and the pressure in them is about 2,000 lb. per sq. in. In order to fill the cells of the two vessels the gas from no less than 38,000 bottles would be required. Special tank cars are now being built for the transport of helium, however, and most of the gas required no doubt will be delivered in them.

From the bottles, or from the tanks, the helium may be taken directly into the gas cells of the airships or it may be diverted into an underground storage reservoir.

New Meccano Part

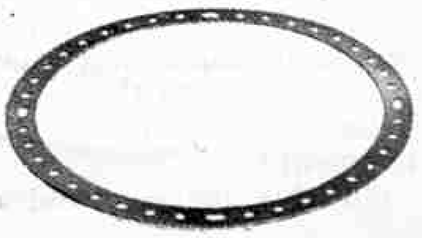
No. 172 Pendulum Connection, each 6d.

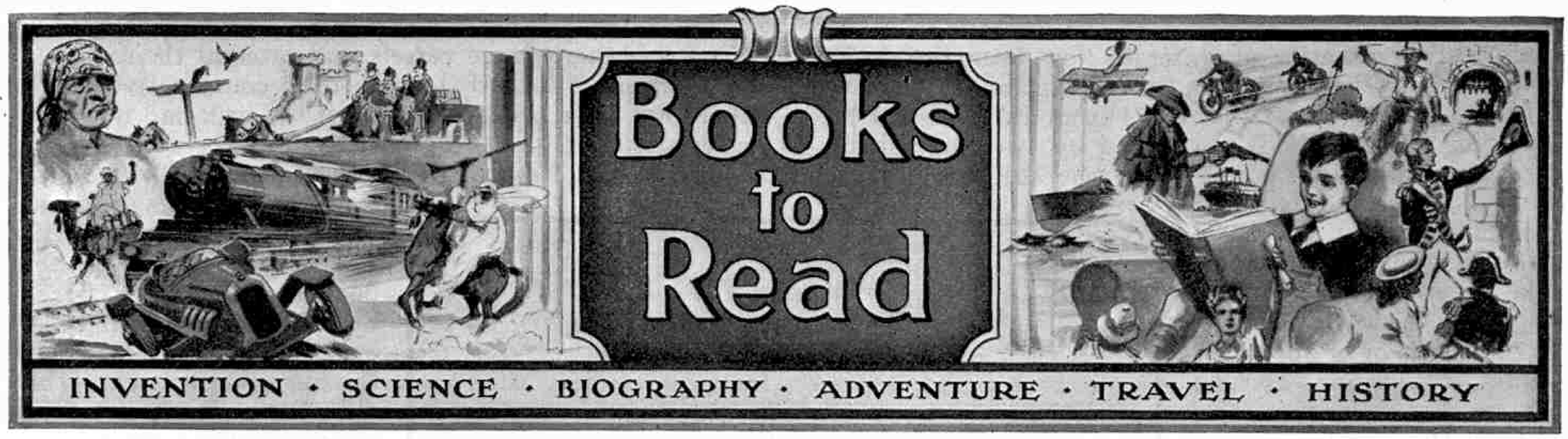
This part is specially designed for use in the Meccano Grandfather Clock (see Instruction Leaflet No. 14) as a means of suspending the pendulum. Its use greatly improves the accuracy of the clock. The part may also be employed in numerous other cases where a small flat spring is required. For example, it is particularly suitable for use as the brush spring in the tiny Meccano electric engine that was described under Suggestion No. 198 in the June "Suggestions Section."

Improved Meccano Part

No. 145, Circular Strip, each 9d.

The overall diameter of this part has been increased from 7″ to 7½″. The advantage of this alteration lies in the fact that a Strip bolted across a diameter of the improved Circular Strip provides a central hole by which the part may be mounted on an axle, and used as a large wheel, etc. The price is not changed.





On these pages we review books that are both of interest and of use to readers of the "M.M." We have made arrangements to supply copies of any of these books where readers find difficulty in obtaining them through the usual channels.

Orders should be addressed to the Book Dept., Meccano Limited, Old Swan, Liverpool, and 1/- should be added to the published price of the book to cover the cost of postage. The balance remaining will be refunded when the book is sent, as postages on different books vary according to the weight and destination.

"Beyond the Rockies"

By Lukin Johnston
(J. M. Dent and Son Ltd. 10/6 net)

"*Beyond the Rockies*" takes us some three thousand miles through little-known British Columbia, yet it is not a travel book in the usual sense. It is best described as a book of many journeys, this way and that, revealing an almost endless variety of country and introducing us to a host of interesting people met by the way.

The Prince of Wales said that the five-hour steamer journey from Vancouver to Victoria was the most beautiful trip of the kind in the world, and Mr. Johnston commences by taking us on a tour through the Archipelago in the Gulf of Georgia, known to the people of the Pacific Coast as "The Gulf Islands." We pass from one lovely island to another, meeting some of the people, mostly from the Old Country, who have settled there, farming and fruit growing. Among the many yarns told by the country folk was one of a man who was troubled about the slovenly dress of the local lads, and tried to improve matters by importing a score of Eton suits and top hats!

Travelling over the Cariboo Highway, which climbs up the face of the mountains and winds its way through the mighty canyon of the Fraser River, the author experienced the never-failing hospitality of the people of the region. He proceeded partly on foot and partly by friendly "lifts" from owners of motor cars of various kinds and qualities. He found some of his rides too exciting to be altogether agreeable, for the roads abound in precipitous slopes and hairpin bends and the drivers without exception seemed to be bitten with a craze for speed. Among them, and not by any means the slowest, was no less a person than the Bishop of Cariboo, who proved to be an expert in dealing with punctures and other mishaps. On one occasion they stuck fast in a ditch full of water, to the unbounded joy of an Indian who witnessed the Bishop's predicament!

On this journey and on many others the author derived a great amount of amusement from people who could not understand that he was just wandering, bound for nowhere in particular. Why he should walk when he had "the price of a ride" was a mystery, and still less understandable was the fact that he was neither fishing nor hunting, and in fact had no desire to kill anything in particular. As an old prospector said: "'Tain't natural for you not to want to murder something!"

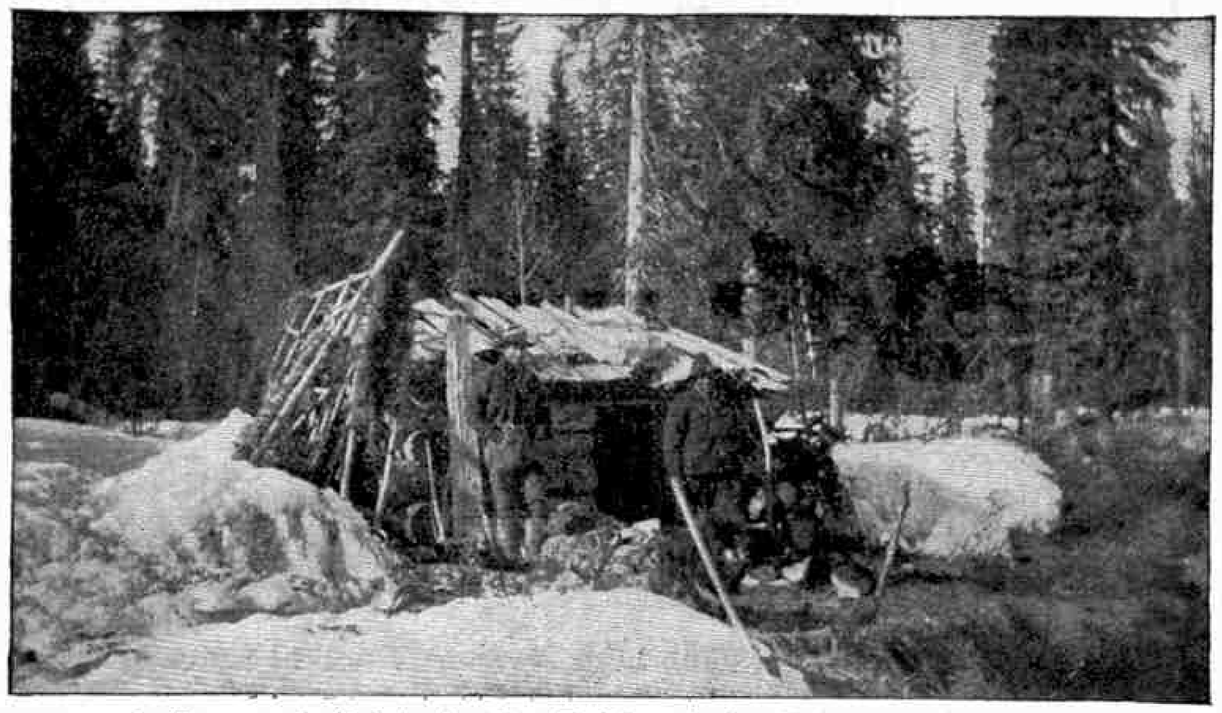
Through the island kingdom that stretches for hundreds of miles along the sheltered coast of the British Columbia mainland, and along the storm-swept coast of Vancouver Island, the author journeyed in the tiny steamboat of the Columbia Coast Mission. In this region the old pioneer spirit is far from dead. On rocky islands, in lonely bays, and along the banks of little-known rivers are settlers battling as grimly with Nature as did the old pioneers of Ontario. In this huge territory settlers living fifty miles apart, and separated by mountain ranges and deep water channels, are "neighbours!"

We have not space to follow the author to the many interesting and often unique places he visited. There is Barkerville, for instance, hidden away in the mountain passes, the terminal point of the old Cariboo road of the sixties and little changed since the gold rush days. Here one finds miners at work "hydraulicing" their claims, and there are also large undertakings such as that at the Low Hee, where thirty miles of ditching was necessary to provide the water pressure required for the huge eight-inch hydraulic nozzles to wash down the thousands of tons of gravel. Not far away the Kafue Copper Company have built an enormous gold dredge, and their operations suggest the vast possibilities of modern machinery and methods.

At Chilcotin, on the occasion of the annual "stampede," may be witnessed some of the finest riding to be seen in the whole of the Canadian West. Bareback riding, steer riding by cowboys and cowgirls, broncho busting and Indian races culminate in the great "Mountain Race," perhaps the most daring horse race in the world, in comparison with which the English "Grand National" is an ordinary affair. In this region, too, are splendid ranches with great herds of cattle. At Fort St. James are trading posts to which Indian trappers bring their furs for sale; and at Kispiox, a weird place on the banks of the Kispiox River, is one of the last entirely Indian villages remaining in this part of the country.

By way of contrast there is in progress in Bridge River Valley a huge scheme which, by 1941, will provide Vancouver, 132 miles away, with 600,000 horse-power.

British Columbia is clearly a great country, and Mr. Johnston's splendidly illustrated book makes one long to visit its wonders.



A Trapper's Cabin in the Babine Lake District (see below).

Trouble on the Cariboo Highway; the Bishop changes a tyre. (From "Beyond the Rockies" reviewed on this page).

"Kings of Commerce"

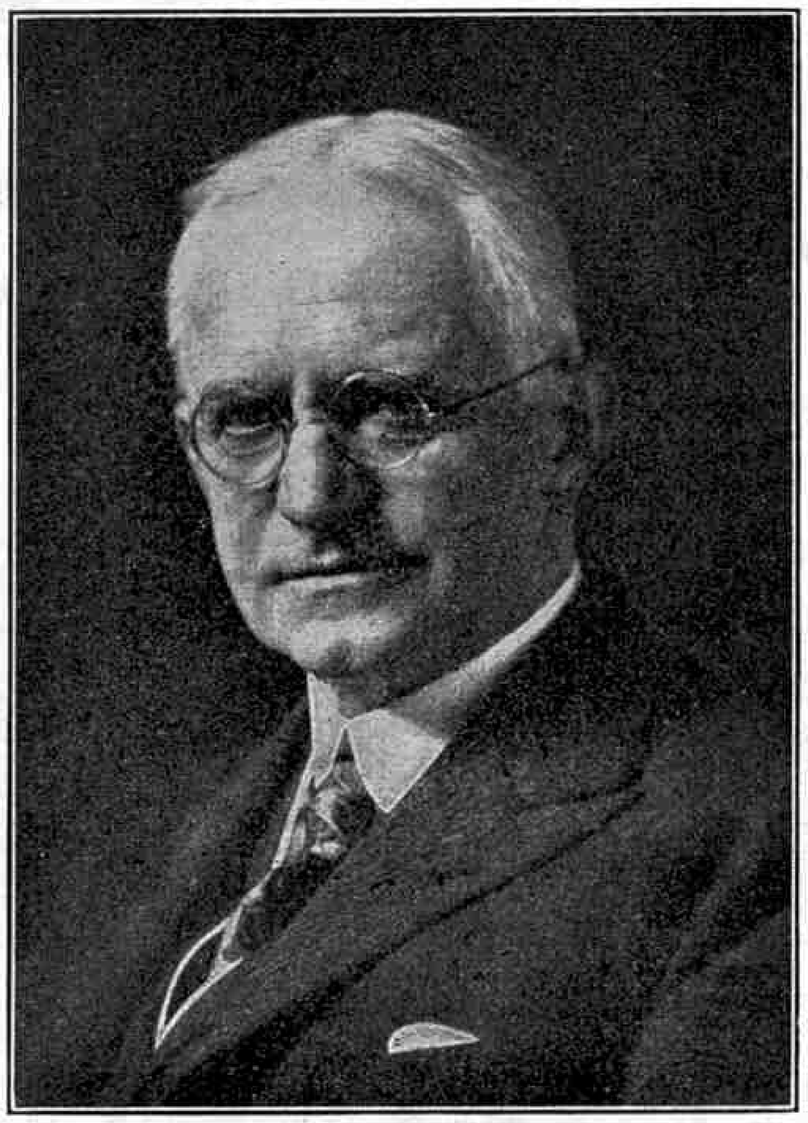
By T. C. Bridges and H. H. Tiltman
(Harrap & Co. Ltd. 7/6 net)

It is usually a rash procedure to state without careful investigation that any particular subject is "of general interest." We are apt to think that because a certain thing interests us it interests others, but in this we may be completely mistaken. There is one subject, however, that has been of general interest from the dawn of history; and that is the careers of people who have achieved outstanding success. It does not matter very much in what direction they have succeeded, the mere fact of their success is sufficient to arouse interest.

"*Kings of Commerce*" gives briefly the main outlines of the careers of twenty-six men who have become great figures in the business world. The names of most of them are almost household words, but some are curiously unfamiliar when one considers the world-wide importance of the men. Henry Ford and his car, for instance, are inseparable; the name applies absolutely to both. On the other hand, while it is impossible to escape from the name "Kodak," it is comparatively rarely—in this country at any rate—that one sees or hears connected with it the name of George Eastman, who is not only the founder of the colossal Kodak business but also in a real sense the founder of modern photography. At the time when Eastman, as a young bank clerk at Rochester, New York State, took up photography, the process of taking a single picture occupied the best part of half a day. The photographer had to carry about with him not only a huge camera and heavy tripod, but also a small chemical works. Having fixed upon a spot from which he proposed to take a photograph, the unfortunate photographer had to set up a dark tent and crawl into it to mix the weird solutions required to sensitise his plates. The photograph had to be taken while the plate was wet, and then the photographer had to disappear into the tent once more to develop the plate on the spot. By his invention of the dry plate, which could be bought in packets ready for use, and subsequently by the production of the celluloid film, Eastman literally invented a hobby.

There is a very curious thing about Eastman's invention of the dry plate. After long experiment he produced an emulsion which, when coated on glass plates, produced excellent photographs. He sold thousands of these plates, and then suddenly the emulsion refused to work! The plates were useless and Eastman was faced with utter ruin. Frantically he worked with the object of finding the cause of the failure, but to no avail; and he only saved the situation in the nick of time by purchasing a formula from England and using this in place of his own. Subsequently Eastman found that his first emulsion was successful on account of some impurity in the gelatine that he was using. As soon as he commenced to use a fresh stock of gelatine that did not contain this impurity, the process failed. From that day to this Eastman has never been able to find what it was in his first stock of gelatine that made his plates successful.

It is interesting to note that most of the men who have built up vast businesses and fortunes have done so by following the same general policy of small profits and big sales. Ford realised from the beginning that success as he planned it could not be obtained by selling a few cars at a big profit, but by selling many cars at a small profit. To take a man in a very different sphere, we find that A. W. Gamage worked on similar lines. At one time there arose a sudden craze for hair brushes with wire



George Eastman, the Kodak King (see below).

set in a pad of rubber instead of bristles, and they were sold all over London at half-a-crown each. Gamage promptly stocked his small shop with these brushes and sold them at eighteenpence. There was little profit, but among the crowd that quickly cleared his stock were many that became regular customers. Similarly,

Sir William R. Morris, the British motor car magnate. (From "Kings of Commerce" reviewed on this page).

when the bicycle boom first arrived, Gamage contracted for a large number of machines and sold them at a price that defied competition. The success of this venture formed the foundation upon which the vast Gamage business has been built up.

All great fortunes have a background of solid hard work, continued unceasingly year after year; the kings of commerce have pushed their way onward by sheer unrelaxing tenacity. Sir Thomas Lipton, who began literally from nothing, has stuck to the motto "Never despair." He has applied this motto not only to business but to his great hobby of yachting, and next month, with "*Shamrock V*," he is to make still another attempt to recover for England the America Cup. All "*M.M.*" readers will wish him success. Few men worked harder than Sir Joseph Lyons, and success did not come to him easily; yet he always maintained that there was no fun like work. When he introduced music in a teashop the proprietors of rival establishments prophesied his bankruptcy. "Lyons can't pay an orchestra out of twopenny cups of tea," they declared; but they were very far wrong. Perhaps the best advertisement Lyons ever received came from King Edward. "I like Mr. Lyons," he said. "He feeds my people well."

A career of quite a different type is that of Sir Robert A. Hadfield, who may truly be called a steel-king. To him the steel industry, not only of this country but of the whole world, owes an enormous debt for his discovery of manganese steel. He announced the discovery in 1888 in a paper read before the Institute of Civil Engineers, and he prophesied that this steel, harder than any previously made, would come into use for all purposes requiring strength and hardness. He has lived to see his prophecy amply fulfilled.

The remaining men described in this interesting volume have achieved success in a great variety of careers. Among them may be mentioned Lord Ashfield, who as a small boy was fascinated with the horse trams that ran past his home in Detroit, and subsequently became Chairman of the London Underground Railways; Sir Hugo Hirst, the founder of the General Electric Company; F. Henry Royce, who designed the Rolls-Royce car; Sir Alfred Yarrow, designer of the world-famous boiler and the builder of high-speed destroyers; and F. W. Woolworth, who died a millionaire, all made on sixpences!

The book is produced in an attractive manner, and is illustrated by a series of excellent portraits.

The Locomotive Engineer's Pocket Book, 1930

(Locomotive Publishing Co. Ltd. 3/6)

This attractive pocket book contains such a wide range of information as to make it of value not only to the engineer and the student, but also to all who are interested in locomotives and their work. In spite of its small size, it forms a valuable book of reference, into which one may dip to obtain facts about record locomotive performances, fastest runs on British railways, details and dimensions of the principal locomotive types, standard wheel arrangements and other matters of general interest. In addition such mysteries as tractive force, horse-power rating, adhesion, weight distribution, and stability on curves are explained, and the calculations involved are stated in the simplest possible manner. A particularly interesting section deals with special types of locomotives, including turbine condensing, internal combustion, Diesel electric, and pulverised fuel locomotives. The whole of the information provided is thoroughly up to date, and is arranged in a simple and convenient manner for quick reference.

Results of Meccano Model-Building Contests

By Frank Hornby

"February" Competition (Home Sections)

THE complete lists of prize-winners in the Home Sections of the special Model-building Competition that was announced in the "*M.M.*" for February, 1930, are as follows:—

Section A (for competitors over 14 years of age).

FIRST PRIZE, cheque for £3-3s.: James F. Huson, Upper Norwood, London, S.E.19. SECOND PRIZE, cheque for £2-2s.: K. W. Cameron, Claughton, Birkenhead. THIRD PRIZE, cheque for £1-1s.: S. Croft Gray, Edinburgh

SIX PRIZES, each consisting of Meccano products to value 10/6: C. T. Glover, Paddington, London, W.10; R. Fairhurst, Bolton; D. C. Field, Bruton, Somerset; John Struthers and Jack Bradley (joint award), Glasgow, S.E.; T. W. Baker, Cheddon Fitzpaine, near Taunton; E. Locke, Port Talbot.

SIX PRIZES, each consisting of Meccano products to value 5/–: S. Foot, Plymstock, near Plymouth; S. Buck, Aston, Birmingham; A. Trotter, Hayes; F. A. H. Day, Sutton; Eric Hemery, Cirencester; George Leslie, Burnbank, Lanarkshire.

SIX PRIZES, each consisting of a copy of "Famous Trains" by C. J. Allen: J. S. Renshaw, Fleetwood; S. W. Cracroft and W. T. Collier, Hull; H. H. Crook, Ashton-in-Makerfield; S. Smith, Edinburgh; M. Edwards, Great Milton, near Oxford; L. J. T. Law, Willesden Green, London, N.W.10.

TWELVE PRIZES, each consisting of a copy of the Meccano Engineer's Pocket Book: I. R. Lloyd Jones, West Bridgford, Notts.; N. Hulbert. Trowbridge; G. S. Marsh, Blackpool; F. Maiden, Bridgnorth; D. McLean, Manchester; M. Collinge, Dublin; J. Birkbeck, Lincoln; J. S. Powell, Stalybridge; W. H. Trenholm, Eaglescliffe, S.O., Co. Durham; J. Matthews, Fillongley, near Coventry; C. Palmer, Ramsey St. Mary's, Huntingdon; E. T. G. Mills, South Wigston, Leicester.

SPECIALLY COMMENDED (Certificate of Merit): P. Diwell, Hastings; W. Burke, Cork; A. A. Nicol, Gargunnock, Stirling; Alex Eckles, Hull; B. H. Seaborn, Lt. Bromley; D. O'Mara Taylor, Birmingham; E. Whalley, Blackburn; P. Banks, Dunstable; B. Giebermann, Hampton; A. Kayll, Ascot, Berks.

Section B (for competitors under 14 years of age).

FIRST PRIZE, cheque for £2-2s.: R. E. Grant, Aberdeen. SECOND PRIZE, cheque for £1-1s.: Brian R. Pollott, Norbury, London, S.W.16. THIRD PRIZE, cheque for 10/6: Margaret Wynn, Manchester.

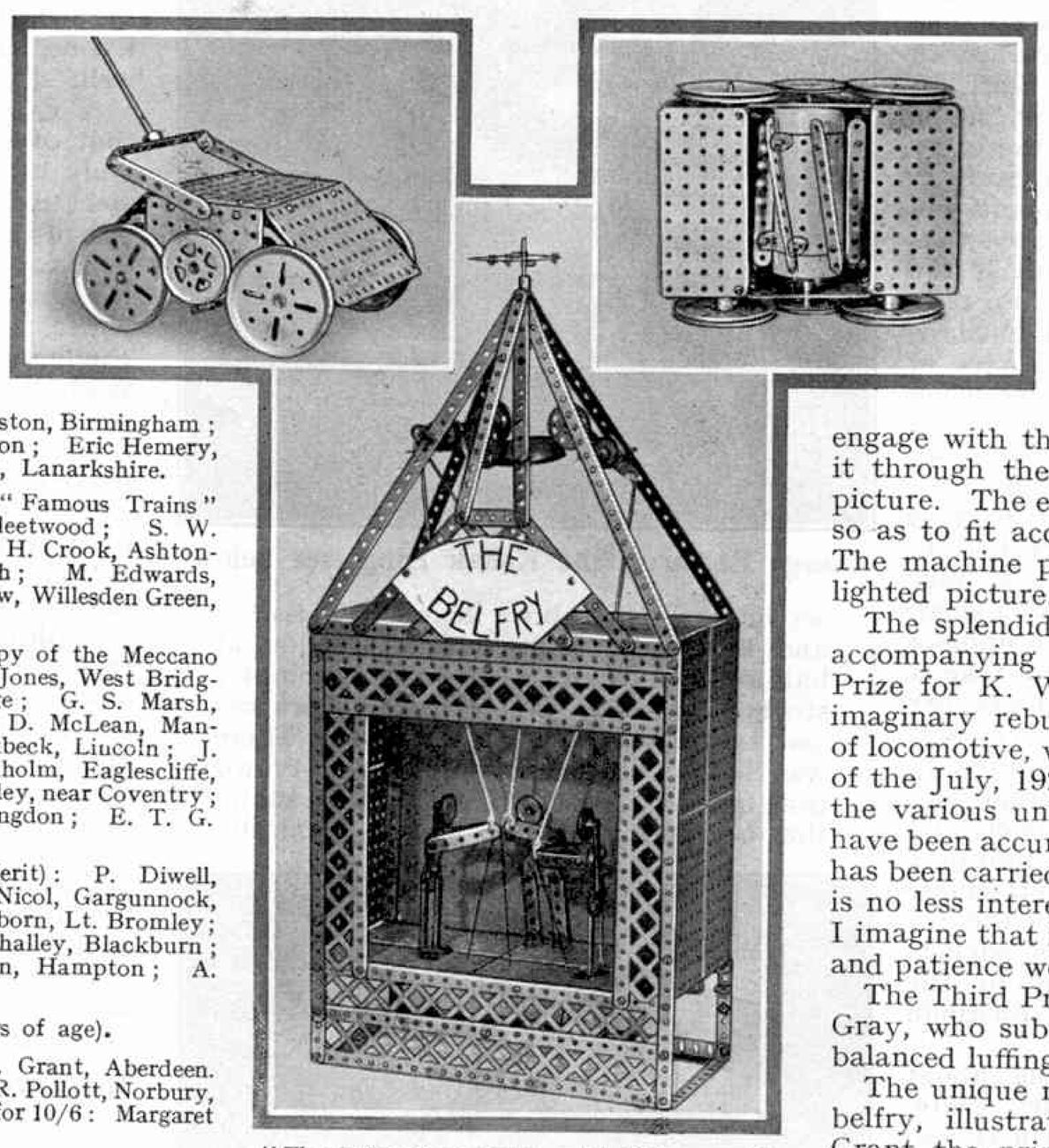
TWELVE PRIZES, each consisting of Meccano products to value 5/–: S. Tyler, Bristol; Keith Robinson, Otley, Yorks.; Harry Causer, Sedgley, Staffs.; R. Chandler, Bexhill-on-Sea; Roy Evans, Cheadle Hulme; Peter Stradling, Harpenden, Herts.; F. Stoakes, Portsmouth; L. C. Bird, London, E.11; J. A. Kemp, Chelmsford; R. C. Hallam, Pinner; N. K. Crooke, Lytham St. Annes; Kenneth Kirby, Hillingdon Heath.

TWELVE PRIZES, each consisting of a Meccano Engineer's Pocket Book: Nelson Cox, Filton, Glos.; Charles Zausmer, London, E.C.1; Norman G. Tucker, Pomphlett, near Plymouth; C. T. Dean, Stamford; R. Swainston, Stockport; M. Picknell, Birmingham; J. S. Pearce, Southampton; E. Alvin, London, N.W.1; R. P. Baker, South Wigston, Leics.; John Kidd, Oxford; F. Claesens, London, N. 1; John Holman, London, S.W.5.

SPECIALLY COMMENDED (Certificates of Merit): S. Dodds, Cottingham; R. A. Panes, Ashley-Vales, Bristol; R. Greer, Ayr; P. J. Gwatkin, Worthing; J. G. Recknell, Sanderstead; T. H. Wareham, Birmingham; H. R. Bestley, Westcliff-on-Sea; F. Ormerod, Wroxham; Colin Boston, Bromborough; Ronald Hough, London, S.E.20.

There are perhaps few subjects more difficult to reproduce in Meccano than a cinematograph, yet J. F. Huson, who won the First Prize in Section A, undertook the task and produced a very successful machine. With the exception of the lens, shutter, and the lamp-house the whole of the model is constructed from Meccano parts.

An out-of-date magic lantern furnished the lens, and the lamp-house and the shutter are made from cardboard. The intermittent sprocket, which is perhaps the most important part of a cinematograph, works on the "claw" principle. The "claws" comprise Pawls mounted on Strips attached to the arms of Eccentrics. The latter are secured on a shaft that is operated in such a manner that at the instant when the shutter is across the lens, the tips of the Pawls engage with the "steps" in the film and drag it through the gate exactly the depth of one picture. The ends of the Pawls are filed slightly so as to fit accurately in the slots of the film. The machine projects a very steady and well-lighted picture.



"The Belfry," complete with Bellringers, by Ray E. Grant. Left inset: B. R. Pollott's cleverly designed model of a Carpet Sweeper, and (right inset) underneath view of the model.

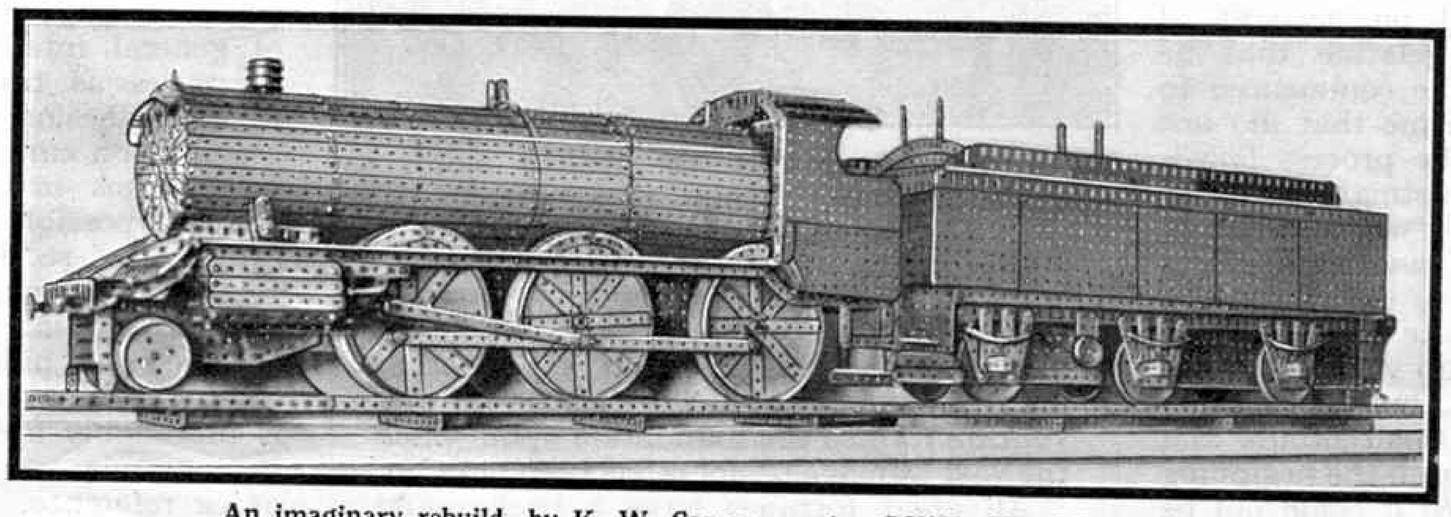
The splendid model locomotive shown in an accompanying illustration secured the Second Prize for K. W. Cameron. The model is an imaginary rebuild of the G.W.R. Mogul type of locomotive, which was illustrated on page 524 of the July, 1929, "*M.M.*" The dimensions of the various units of the engine and its tender have been accurately scaled and the construction has been carried out very carefully. The tender is no less interesting than the engine itself and I imagine that in building it a good deal of time and patience were expended.

The Third Prize in Section A went to S. Croft Gray, who submitted a remarkable model of a balanced luffing jib crane.

The unique model of bellringers at work in a belfry, illustrated herewith, won for Ray E. Grant the principal prize in Section B. The model can be set in motion by means of a Meccano Clockwork Motor that is hidden in the base beneath the platform on which the "bellringers" are mounted.

Underneath the platform are three Bush Wheels mounted on Rods and connected by threads to the arms of the bellringers, and the arms, in turn, are connected by further threads to the bell clappers in the spire. When the Motor is set in motion the Bush Wheels rotate and cause the threads to actuate the bell clappers. Each ringer strikes in rotation and the effect is most realistic.

The younger Meccano boys seem to be enthusiastic searchers for something new to model, for another strikingly original entry secured the Second Prize in this Section. This time it was a carefully constructed miniature of a rotary brush carpet sweeper. It was built by Brian R. Pollott and is illustrated herewith. It will be seen that excellent use is made of a Meccano Boiler to represent the revolving brush.



An imaginary rebuild, by K. W. Cameron, of a G.W.R. Mogul locomotive.

Second "Simplicity" Contest (Overseas Section)

The second contest of the "Simplicity" series has proved conclusively that competitions of this nature are tremendously popular not only with Meccanoites residing in the British Isles, but also with boys and girls living across the seas. As explained in the announcement, the main points looked for when judging entries in contests of this type are realism combined with simplicity, and the avoidance of all unnecessary parts.

Some competitors in the Second contest secured really amazing results, many of the models astonishing even our own skilled model-builders! Indeed, at one time it seemed almost impossible to decide on the most meritorious models, but after repeated processes of elimination it was at last decided to award prizes to the competitors named in the following complete list.

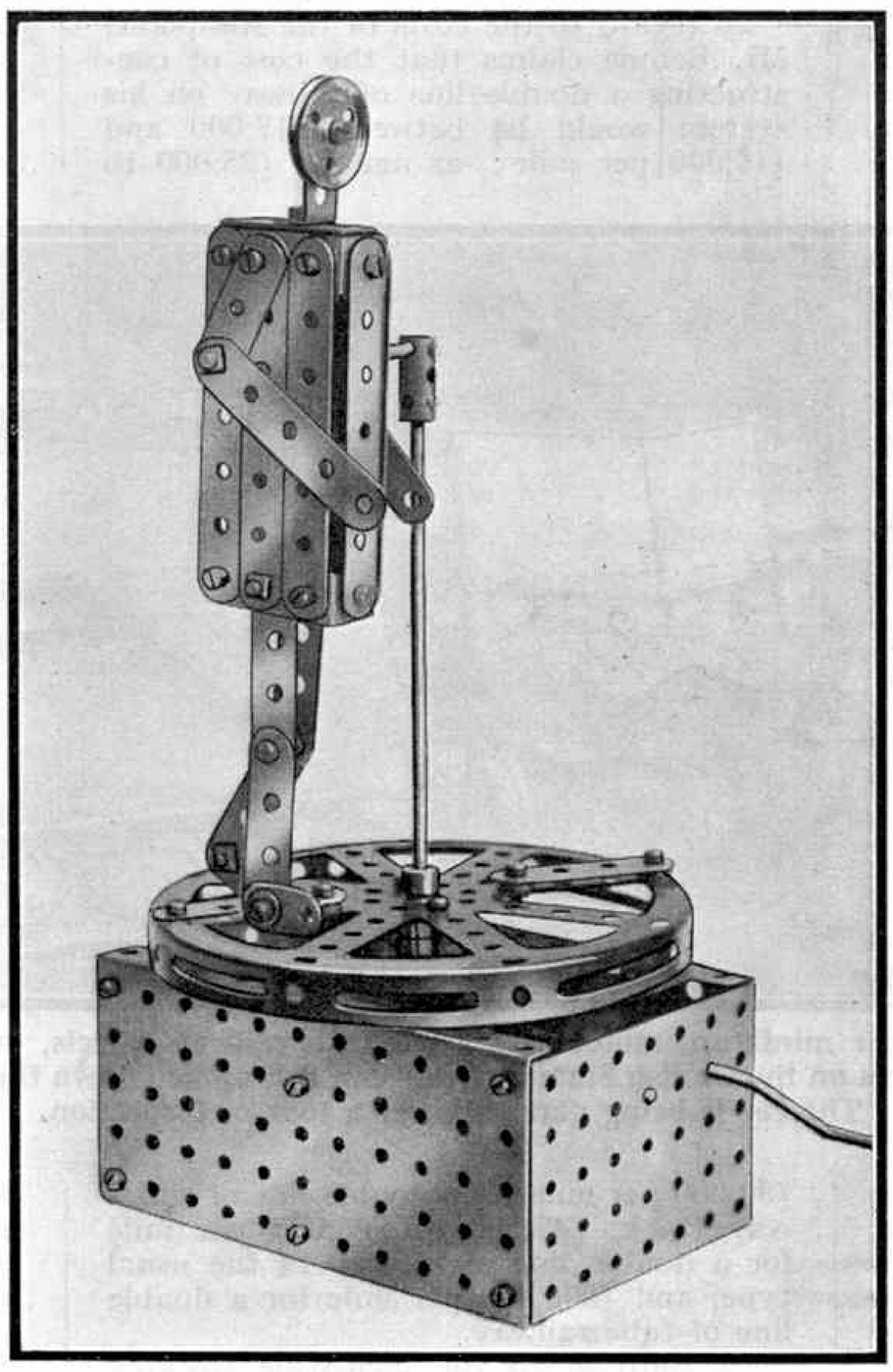
FIRST PRIZE, Meccano products to value £2-2s.: Don Parker, Waipukurau, Hawkes Bay, New Zealand. SECOND PRIZE, Meccano products to value £1-1s.: D. J. Roberts, Durban, South Africa. THIRD PRIZE, Meccano products to value 10/6: J. Richardson, Epsom, Auckland, New Zealand.

SIX PRIZES, each consisting of Complete Instruction Manuals: Jim Jessen, Dargaville, New Zealand; P. Woodman, Tenerife, Canary Isles; R. T. J. Blick, Southland, New Zealand; W. Russell, Whangarei, New Zealand; E. Worthington, Vancouver, B.C.; M. Strasberg, Brooklyn, New York.

A number of Certificates of Merit have also been awarded.

Don Parker's model represents an old-time "penny-farthing" bicycle. The large front wheel comprises a 6" Pulley Wheel fitted with a rubber ring for the tyre. The rear wheel, a 2" Pulley, is fitted with a Meccano Dunlop Tyre, which rather detracts from the realism of the model in view of the fact that pneumatic tyres were unheard of in the days when "penny-farthing" bicycles were the latest thing for "high-speed" travel!

A realistic model of a high-power racing car constructed with less than thirty parts (including nuts and bolts) carried off the Second Prize for D. J. Roberts. A ½" Pulley is used to represent the steering wheel, and the long bonnet common to cars of this type is produced with the aid of a Channel Bearing.



This model of a Joy Wheel Dancer secured a prize for J. Wilson, of Aberdeen, in a recent "Simplicity" Competition.

A racing motor car also comprised the entry from R. T. J. Blick and, by a coincidence, it is constructed in a manner very similar to Roberts' model. The Third Prize was awarded to J. Richardson for a model of a single-seater monoplane.

It would be interesting to know how the queer subject of Jim Jessen's entry suggested itself to its builder, for the model represents a snail! This very original effort has a most realistic appearance, and from first glance it is hard to believe that it comprises only six parts—a Bush Wheel, a ½" loose Pulley, two Bolts, and two Curved Strips! The snail's body is formed by bolting the two Strips end to end so that they resemble an attenuated "S." The Bush Wheel is used to form the shell, which is carried on the snail's back in the regulation manner! It is secured in position by the same Bolt that connects the Curved Strips. Lifelike "horns" are made from two short pieces of wire.

Several competitors chose army tanks as subjects for their entries, the most notable model of this type being that submitted by P. Woodman. Edwin Worthington secured a prize for a splendid little model of a ship's capstan, the barrel of which is formed from Curved Strips secured between 3" Pulley Wheels.

A model of a steam shovel comprised M. Strasberg's entry. A unique feature of this model is the fact that it is equipped with "creeper" tracks, consisting of elastic bands stretched over Collars secured to the axles. Both the jib and the shovel arm are built up from short lengths of Screwed Rods, while the shovel itself comprises two Double Brackets bolted together.

W. Russell's model is a miniature swivelling crane, in which a Channel Bearing is employed to form the housing for the "mechanism." It is secured to a Bush Wheel that is loosely held on a ¾" Bolt secured in a hole of a Flat Girder that comprises the chassis. Loads are raised or lowered by turning a handle, that operates a short Rod journalled in the Channel Bearing, and round which the hoisting cord is wound.

Third "Mechanisms" Contest (Overseas)

In this contest, Meccano boys were asked to devise a mechanism that would connect two pistons moving simultaneously but in opposite directions in a cylinder, one piston having a stroke of 3" and the other one of 4". Many solutions of this problem were exceptionally interesting, and the entries of three competitors, in particular, were considered equal in every way, so that the judges had a very difficult task in allocating the various awards. After lengthy consideration it was agreed that in order to treat each of the three competitors fairly it would be necessary to combine the original First, Second and Third Prizes, and to divide the amount equally between them.

The full list of prize-winners is as follows:—

FIRST PRIZE (tie, each of the following three competitors receiving Meccano products to value 15/6): A. S. Adams, Durban, Natal, S. Africa; E. Marchant, Wanganui, New Zealand; Kwa Soen Hock, Singapore, S.S.

SIX PRIZES, each consisting of a Meccano Engineer's Pocket Book: Hans Krutz Berlin; J. K. Morton, Sydney, N.S.W., Australia; J. A. Rodriguez, Montreal, P.Q., Canada; Chew Cheng Kiat, Singapore, S.S.; H. Curry, Windsor, Canada; D. R. Heeramaneck, New Gamdevi, Bombay, India.

The problem which formed the subject of the competition appeared on page 38 of the "*M.M.*" for January, 1930.

The majority of competitors solved it by employing arrangements of pivoted links, but a few elected to use more complicated but equally efficient systems of rods and gearing.

The solutions submitted by the principal prize-winners ran on somewhat similar lines and in the "Suggestions Section" of a future issue of the "*M.M.*" we hope to describe one or two representative entries.

Second "Parts Required" Contest (Home)

No single competitor in the Home Section succeeded in making an absolutely correct list of the parts required to build the Meccano model motor lorry that was illustrated on page 223 of the "*M.M.*" for March, 1930, and accordingly the prizes have been awarded to those competitors whose lists most nearly corresponded with the actual parts used in building the model.

FIRST PRIZE, Meccano products to value £1-1s.: H. R. Smith, Wallington, Surrey; SECOND PRIZE, Meccano products to value 15/-: Edwin Day, Blacker Hill, near Barnsley, Yorks. THIRD PRIZE, Meccano products to value 10/6: William K. Magee, Manchester.

TWELVE PRIZES, each consisting of a Meccano Engineer's Pocket Book: A. Wright, Langley Mill, Notts.; C. F. Allen, Thorpe Bay, Essex; F. Higson, Myre Ash, Mellor, near Blackburn; R. E. Williams, Portsmouth; J. L. Nelson, Sherbourne, Dorset; T. K. Dowty, Whaddon, near Salisbury; Eric Revell, Marsh, Huddersfield; J. H. Ashton, Market Harborough; E. Mallalieu, Leamington Spa; Roy Webb, Bishop's Stortford; G. M. Jones, West Kirby; H. Snowdon, York.

Almost all competitors overlooked the fact that the lorry is loaded with Meccano Miniature Sacks, and of the few competitors who did include the Sacks in their lists many failed to estimate the number correctly.

The Overseas results will be published as soon as possible, and it will be interesting to note if entrants abroad have been more successful than those who entered in the Home Section.

Both the first and the second "Parts Required" Contests brought very large numbers of entries, and in view of the evident popularity of competitions of this type it has been decided to continue the series in the near future. All Meccano enthusiasts should watch for the announcement of the next contest, in which many handsome prizes will again be given.

Fighting the Forest Fire Menace—

(*Continued from page 597*)

was dismantled, taken down to the lake and carried out to a safe distance on a raft. After a desperate struggle the rangers who were fighting the fire were able to save the post and when all danger was over the apparatus was brought back and fitted up again ready for further service.

Apart from permanent observation posts the task of fire-fighting in the old days had to be carried out by patrols consisting of a ranger and his assistant who travelled by canoe along the various waterways. These patrols accomplished some wonderfully good work but they were always hampered by the fact that their range of vision was so severely limited. It was quite possible for them to pass close to a fire and yet know nothing about it. Smoke was really their only guide and when it was observed the ranger stepped ashore and set about the laborious and difficult task of following the smoke up to the scene of the fire. Having located the fire he then had to make his way to the nearest telephone in order to call up the necessary assistance and this involved the loss of very valuable time. The aeroplane has changed all this by providing a means whereby the patrols can watch large areas of forest and travel quickly to the scene of a fire, estimate its extent, and report to head-quarters by wireless. More than this aeroplanes are able to render very valuable assistance during the fighting of a big fire by reconnoitring and keeping the fire-fighters informed of every fresh development.

Observation posts situated on hill tops are now being supplemented in some areas by observation towers. For instance a steel tower 110 ft. in height, with a glass enclosed cabin at its top, is to be erected near Doaktown in New Brunswick. It will be used by the Provincial protection service to overlook vast timbered areas of the south west Miramichi river district and it will be the 25th tower in the existing system of forest protection towers located in the provinces.

High-Speed Transport—

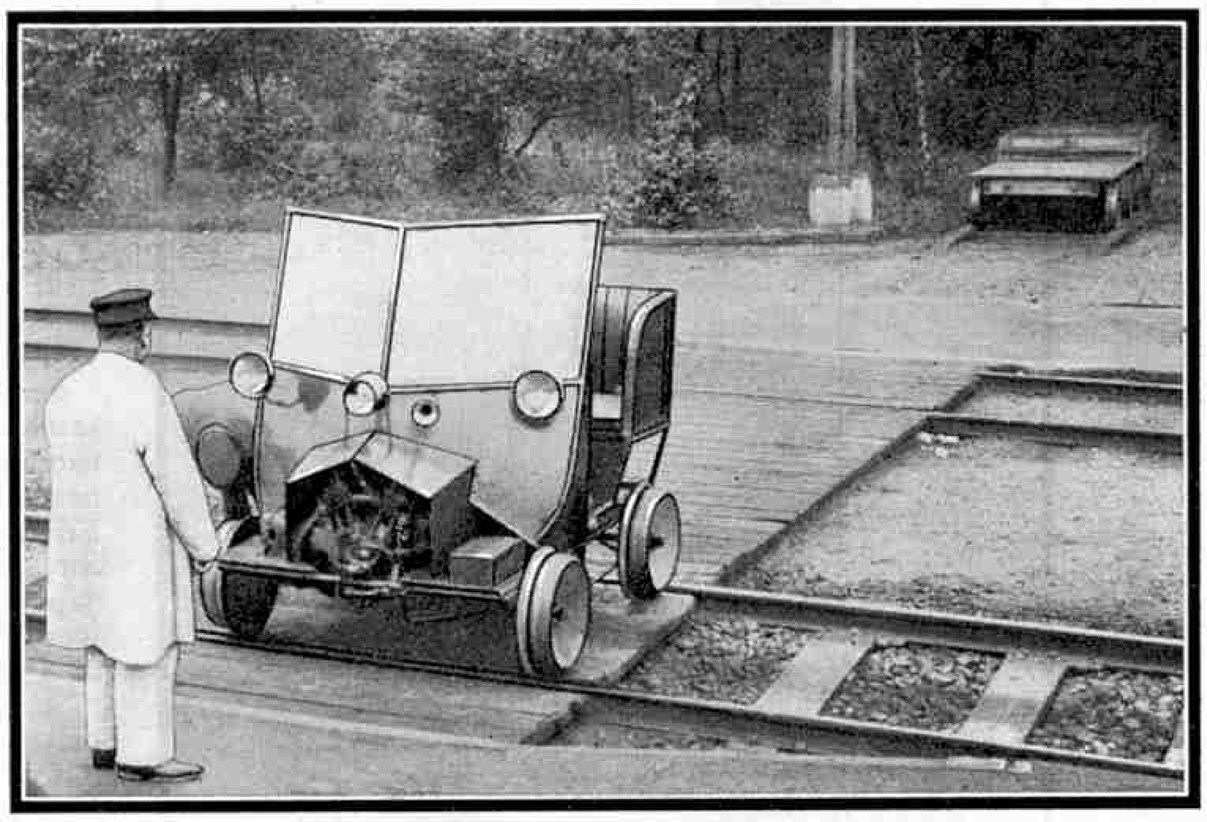
(*Continued from page 595*)

is that an elevated roadway for fast motor traffic and foot pavements for pedestrians could be provided above the rail track.

Mr. Bennie was awarded a gold medal at the Industry Exhibition in Edinburgh and a gold medal at the Glasgow Exhibition in February 1930, for merit in respect to his system; and a large-scale model installation of the Railplane system aroused considerable interest among scientists who attended the meetings of the British Association held in Glasgow in September 1928. In demonstrating his model Mr. Bennie explained that his Railplane was designed in the first instance to be constructed over a railway. His idea was that if the Railplane were erected over an existing line the permanent way would be left free for dealing with ordinary goods traffic, the Railplane being reserved for passengers, mails and perishable goods. The cigar-shaped cars would each accommodate 50 people. As regards safety, Mr. Bennie showed that by reversing the propellers the car could be pulled up in less than half its length without the application of any friction brakes. Power and hand brakes are however fitted to the car.

In regard to the costs of the Railplane, Mr. Bennie claims that the cost of constructing a double line of railway on his system would be between £17,000 and £19,000 per mile; as against £25,000 to £30,000 per mile for a double line of tramway track, £47,500 to £65,000 per mile for a double line of railway of the usual type, and £800,000 per mile for a double line of tube railway.

In addition to the inch-scale working model in Mr. Bennie's showroom, a full-sized Railplane test line has been constructed over the London and North Eastern Railway Company's track at Milngavie, near Glasgow. On this line a full-sized electrically-driven Railplane car, constructed by William Beardmore and Co. Ltd., of Dalmuir, will be thoroughly tested. If successful the invention should go far toward solving the pressing problem of really economic high-speed transport, and therefore the results of the tests will be awaited with great interest, not only by the railway world but also by the travelling public.



One of the miniature motor cars fitted with railway wheels, on which platelayers on the Danish State Railway can run up and down the tracks. The car is being garaged after a tour of inspection.

Photography Simplified

The second of a series of interesting booklets by Burroughs Wellcome & Co., under the title of "*Photography Simplified*," deals with the question of development by the "time and temperature" method, which is not only the most scientific but also the safest method. In the old days development was full of pitfalls and when really good results were obtained many of us were thankful and, to tell the truth, rather surprised! The method outlined in this booklet is not only simple but completely free from uncertainty; and it enables even a beginner to obtain the best possible results from all his exposures. The booklet includes illustrations showing the difference between correct and incorrect development and demonstrating the improvement in poor negatives that can be effected by suitable intensification and reduction. A thin negative, in which detail is present, but is too faint to print out, can be improved wonderfully by intensification; and reduction will make an opaque, over-exposed or over-developed negative into one that will give quite a satisfactory print.

A copy of this attractive and practical little booklet will be sent post free to any reader who mentions this Magazine, by Burroughs Wellcome & Co., Snow Hill Buildings, London, E.C.1.

Lighting of Air Routes—(*Continued from page 603*)

lighting arrangements are exceedingly elaborate and of the highest efficiency. The main feature is the neon gas beacon that enables aircraft to locate the aerodrome from a distance. An ordinary white light has certain disadvantages for such a purpose, particularly on account of its lack of distinctiveness, which renders it liable to be confused with motor car headlights, or even with street lights. For this reason a neon gas light is used which, on account of its distinctive red colour, stands out prominently among all other lights. Another point in favour of the neon light is that it is found to be superior to white light in penetrating fog or mist. The candle-power of the beacon is 6,080, and it has a normal range of 45 miles, although it has been seen in unusually favourable weather conditions from a distance of about 80 miles. A portable floodlight mounted on a 30 h.p. tractor can be elevated up to an angle of 45 degrees from the horizontal, and also rotated. It thus affords a means of sweeping the sky with a powerful beam, and of providing a horizontal and stationary beam over which an incoming aircraft may land. The beam is of 1,000,000 candle-power, and is capable of illuminating the aerodrome for a distance of 600 yards for landing purposes. There are also automatic red flashing lights to mark the boundary of the safe landing area, and red obstruction lights to warn pilots of the presence of high structures in the vicinity.

Night flying has been developed to a considerable extent in Germany, and excellent systems of route lighting are in use. These include revolving beacons, neon lights and intermittent lights of various types for different purposes. The air routes originating in Germany are developing rapidly, and a corresponding development of route and airport lighting is certain to take place in other countries on the Continent.

Important Notice

We have pleasure in announcing yet another reduction in the price of the Meccano Nuts and Bolts. This reduction is made possible by reason of the fact that we have recently introduced in the Meccano factory some wonderful new machines which, whilst working with perfect accuracy, are capable of turning out no less than 150,000 Nuts and Bolts every day.

The Nuts and Bolts are now obtainable in boxes containing one dozen, fifty or one gross. It should also be noted that the two parts may now be obtained separately, boxes in which a dozen bolts or nuts are packed being included in the range of Meccano products. The new prices are as follows:—

No. 37	Nuts and Bolts,	per box of	12	3d.
,, 37f	,,	,,	50	1/–
,, 37g	,,	,,	144	2/9
,, 37a	Nuts only	,,	12	2d.
,, 37b	Bolts only	,,	12	2d.

A NEW "Lynx-Eye" Competition

Another Test for Sharp-Eyed Model-Builders

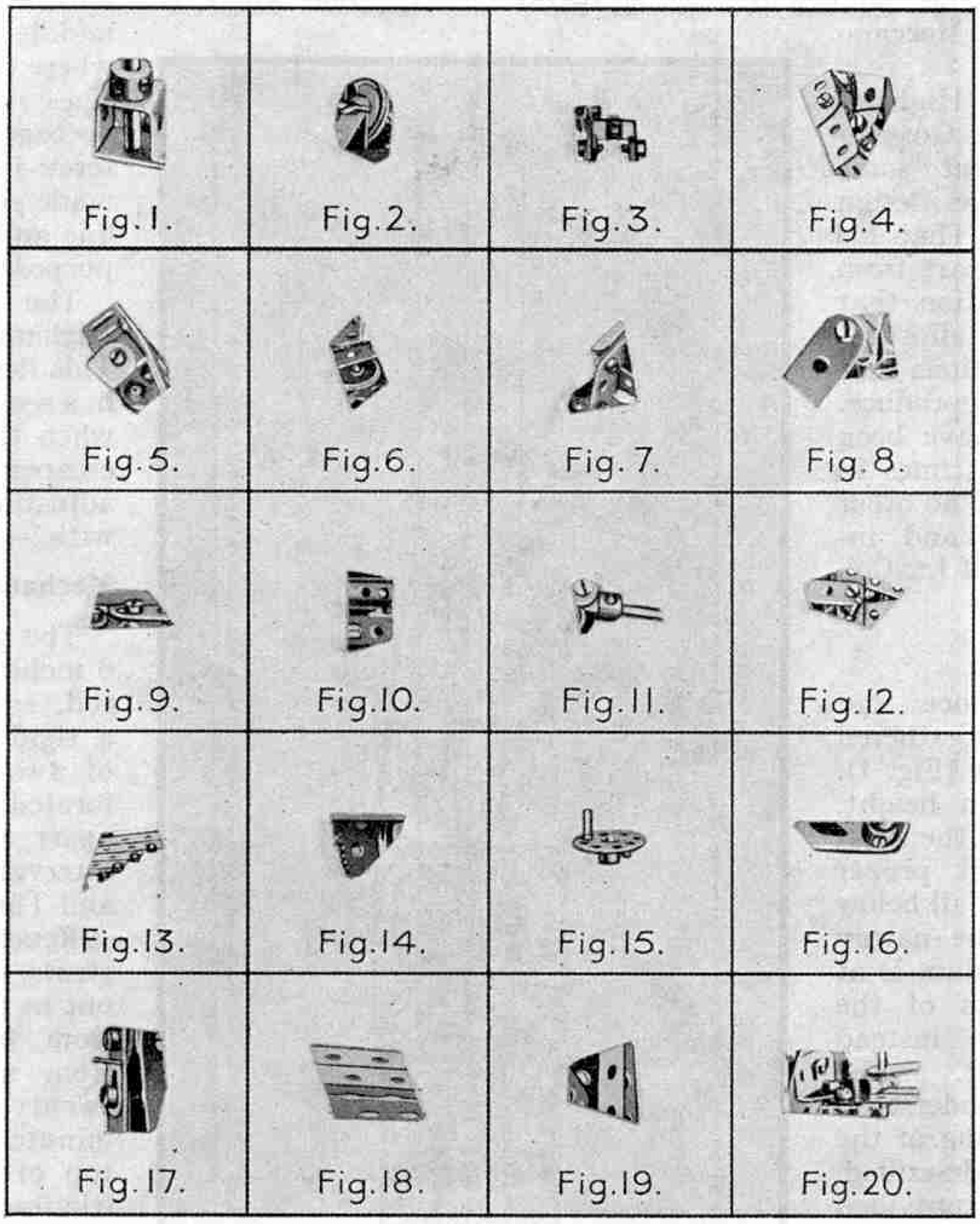
CAN YOU SOLVE THESE PUZZLE PICTURES ?

SINCE the results of the 1929 "Lynx-eye" Contests were published, we have received many letters from Meccanoites all over the world asking us to organise further competitions of the same type, and we have taken the opportunity this month to do so.

"Lynx-eye" Competitions are particularly suited for a summer pastime, for in order to participate in them it is not necessary to stay indoors building models, as in ordinary Meccano model competitions. To enter this competition a Meccano boy only requires copies of the 00-3 and 4-7 Instruction Manuals, a pencil, paper and a sharp pair of eyes; therefore competitors can prepare their entries equally well while at home or on holiday.

The task before the competitor is to find out from which models in the 00-3 or 4-7 Manuals the twenty fragmentary pictures illustrated in the centre of this page have been extracted. It must be mentioned that all the models concerned appear both in the 1929 and the 1930 Manuals.

The parts shown in the fragments will in several cases provide clues to help solve the puzzle. For example, if the picture contains part of a Coupling or Gear Wheel it is obvious that the model will not be found in any of the Outfits up to and including No. 2.



The fragments illustrated have not necessarily been printed in the exact positions and angles at which they appear in the Manuals. Some of the pictures are inverted while others are placed at slightly different angles to the positions they occupy in the Manuals.

The contest will be divided into two sections: Section A, for readers residing in the British Isles, and Section B, for readers of all ages residing Overseas.

The prizes that will be awarded in each Section are as follows: First Prize: cheque to value £1-1s.; Second Prize: cheque to value 15/–; Third Prize: cheque to value 10/6. Twelve copies of Mr. C. J. Allen's book "Famous Trains," and twelve Meccano Engineer's Pocket Books will also be awarded in each Section. In the event of more than one competitor solving all the puzzle pictures correctly, the prizes will be awarded to the first entries examined.

Competitors should not be discouraged because they cannot solve all of the twenty pictures. If no competitor succeeds in solving them all, the prizes will, of course, be awarded to those boys who submit the greatest number of correct solutions.

All entries should be on postcards. The competitor must first write down on his card the reference numbers which he will find printed just inside the border in the bottom left-hand corners of the front covers of the 00-3 and 4-7 Manuals. Thus his card may be marked "Manuals Nos. 29 and 29a" or "Manuals Nos. 29 and 30a," etc. Then, as each picture is solved he should write down carefully first the number of the picture and then the number of the model from which it is taken. The postcard must in addition contain the competitor's name, age, and full address, together with the letter "A" or "B," indicating the Section for which the entry is eligible. Postcards must be addressed "Lynx-eye" Contest, Meccano Ltd., Old Swan, Liverpool. Entries for Section A must reach this office not later than 30th August, and for Section B, not later than 29th November, 1930.

Meccano Clock Nearly 10 ft. High

Bombay Government Official's Wonderful Model

EVERY one who is familiar with its principles, knows that Meccano is far from being merely a toy. Articles have appeared in the "*M.M.*" from time to time showing that the system is of great practical value to engineers, inventors, and scientists, and that it is regularly used by engineering firms for experimental purposes. It also forms an ideal hobby for men who delight in setting themselves tasks which, whilst exercising their intellects, afford pleasant contrasts to their ordinary business. This is borne out by the remarkable number of artists, lawyers, doctors, and men in similar professions who find their greatest relaxation in "creating" Meccano models.

Lieutenant-Colonel B. Higham, Chemical Analyser to the Government of Bombay, spent some eighteen months on the design of a Meccano clock. That his time was not wasted, apart from the value of the recreation that the building must have afforded, is proved by the illustrations that we are now able to reproduce. Many forms of clocks have been constructed at different times in Meccano, but we know of no other of quite such original and interesting design as that of Lt.-Col. Higham.

Overhead Pendulum

The general appearance and layout of the clock can be gathered from the full length view (Fig. 1). It stands 9 ft. 9 in. in height, but—and this is one of the most novel features—the clock proper ends just below the face, all below that being merely in the nature of a stand. The pendulum is at the top and the works of the clock are at the bottom, instead of the other way about. The reason for this will be understood later on when the working of the escapement has been described. A "seconds hand" is provided with a separate dial, which can be seen immediately beneath the dial proper in Fig. 1.

The clock is driven by ten Meccano Clockwork Motors, all coupled together and driving on to a common main shaft. This fact may deter many Meccano boys from building the model unless they wish to keep it built up permanently, for it is doubtful whether many uses would afterwards be found for so many Motors. However, those readers who prefer the gravity method of propulsion will still find many features of this clock of very great interest; indeed, the clock could be converted by substituting weights for the Clockwork Motors without a great deal of alteration to the remaining sections.

For convenience in transport the clock can easily be separated into three approximately equal parts, and as quickly reassembled, the position of the two dividing zones being plainly discernible in the illustration, viz., one where the narrow top part joins the wider middle portion and the other where the clock rests on the stand. The stand is mounted at the bottom on four short adjustable screw-feet by which it can be made perfectly level, and a plumb-line and bob are provided for this purpose.

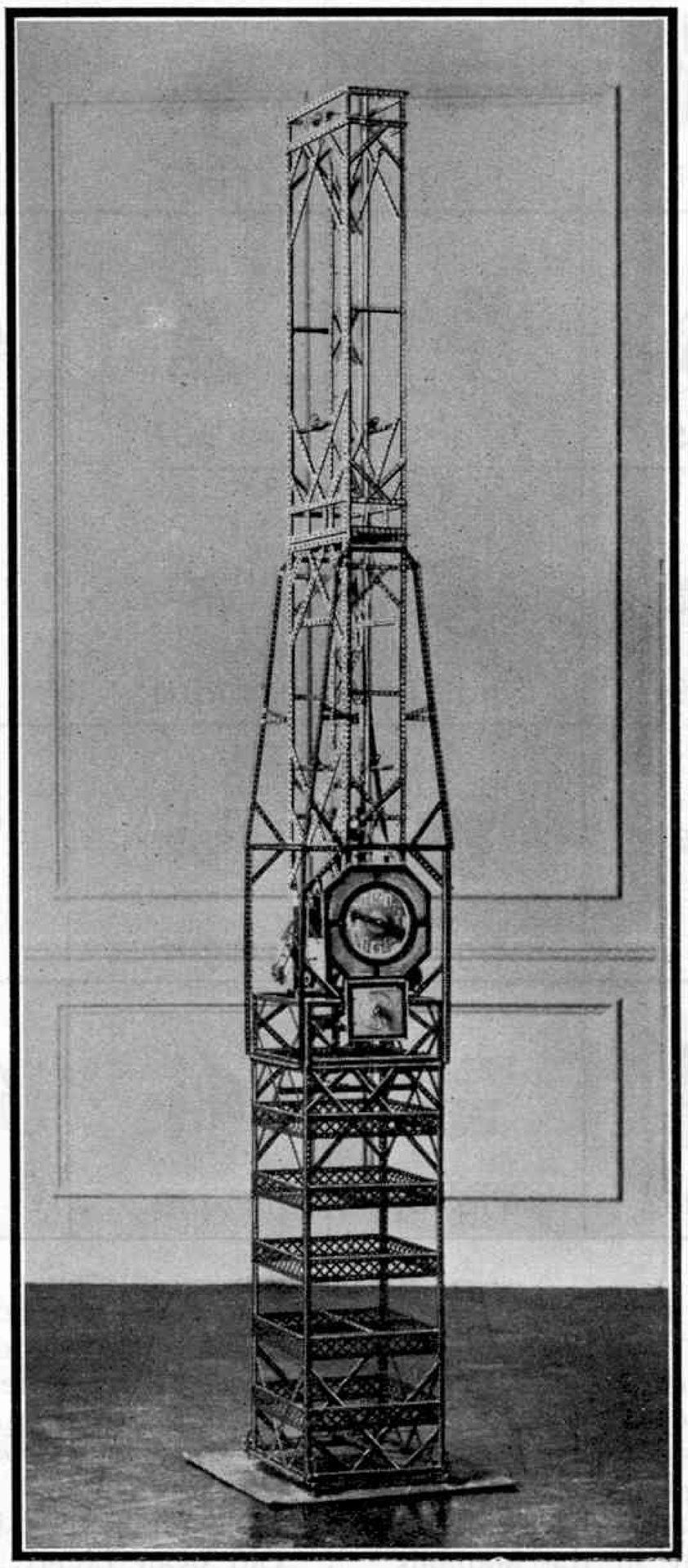


Fig. 1. General view of the Clock. The pendulum is mounted above the Clock mechanism.

The following is Lieut.-Col. Higham's description of the clock. This description will be continued in a second instalment next month, when the main driving train, the escapement mechanism and the adjusting devices will be dealt with:—

Mechanical Details

The pendulum is about 5 feet 6 inches long and is not a simple rod, as it is in most clocks, but a rigid lattice girder constructed of two parallel lengths of Perforated Strip, placed $2\frac{1}{2}$ inches apart and connected together at intervals by Double Angle Strips and Threaded Rods and nuts, and stiffened by a series of five X-shaped struts, all of which can be made out in the illustration. It swings from front to back instead of from side to side and makes twenty-five double swings in every minute. It is suspended from the top of the frame and to reduce friction, which would otherwise be very considerable at this point, its axle rests at each end in the interval between two Flanged Wheels, which rock slightly to and fro as the axle rolls backward and forward on them.

For transport the pendulum is separated into two parts corresponding with the upper and middle sections of the clock. Clips are provided to hold each of the two

portions firmly in the frame when separated and a special mechanism has been devised to insure that when reassembled the length of the pendulum shall be precisely the same as before. In the ordinary way Meccano construction does not admit of adjustments of length of less than half an inch. By means of Slotted Strips (parts Nos. 55 and 55a), however, finer adjustments are possible and at one point in the pendulum a slotted union has been provided so that the level of the lower end of the pendulum can be adjusted to a nicety.

This end, which is shown in Fig. 2, is equipped with three heavy brass paperweights, placed one above the other. The outlines of all three of the weights can just be made out in Fig. 2, and of two of them in Fig. 4 (to appear next month). These are the only parts of the whole clock which are not standard Meccano accessories. They are suspended in a cage which can be raised or lowered by turning the Threaded Rod 1. This end of the pendulum also contains some of the integral parts of the escapement mechanism, but these will be described later on, when the effect of raising and lowering the cage of weights will also be considered.

The motive power of the clock is provided by ten Meccano Clockwork Motors, four at the back and three on each side. When fully wound the clock goes for between twenty-eight and thirty hours and after going for twenty-four hours as in ordinary running, each of the ten keys has to be given about nine half turns to wind the clock up fully again. When a Meccano Clockwork Motor is completely run down it requires about eighteen half turns of the key to wind it up fully. After twenty-four hours of running, then, the Motors in this clock are still only about half run down and this is a suitable arrangement because, while the Motors maintain their power at a fairly constant level during the first half of their course, thereafter they depreciate fairly rapidly.

The Motors on the "9 o'clock" side of the clock drive ahead and those on the "3 o'clock" side in the reverse, and the reversing levers of all the Motors are secured in the requisite position by Strips and bolts to prevent accidental movement. The advantage of using the terms "9 o'clock" and "3 o'clock" instead of "right" and "left" for the opposite sides of a clock will be readily granted.

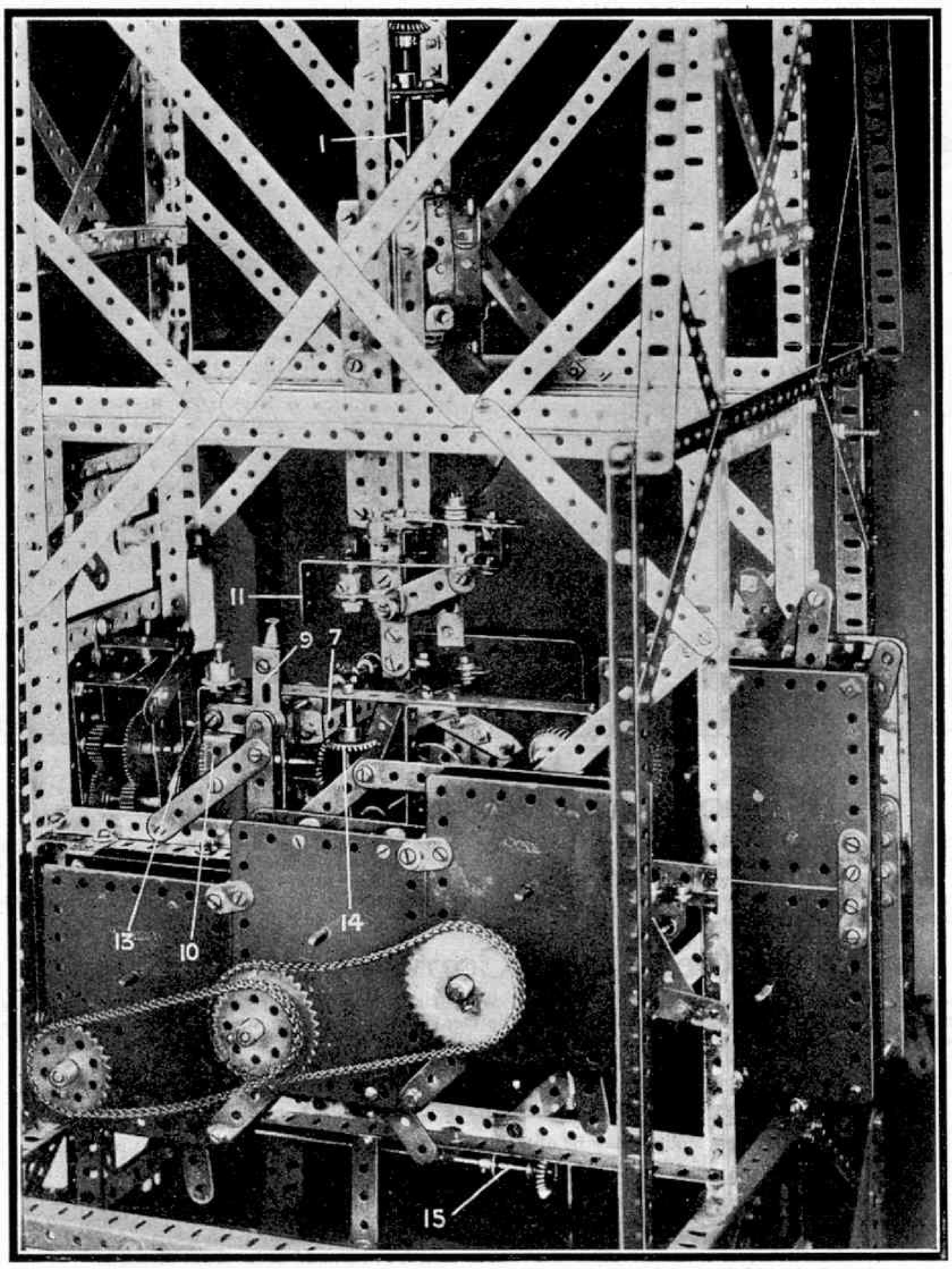


Fig. 2. The mechanism from the "3 o'clock side," showing some of the driving Motors and the lower end of the pendulum.

During the construction of the clock it was useful to be able to apply the brake to any particular Motor at will. This necessitated a slightly different method of linking the Motors on the two sides. Fig. 2 shows the arrangement adopted for three Motors driving in the reverse direction. The Motors are connected together by Chains and Sprockets, the back Motors in pairs and the side Motors in sets of three, and finally each set of Motors drives through a 2" Sprocket and a $\frac{3}{4}$" Sprocket on to the main shaft. The gearing from this shaft to the escapement and hands will be described next month.

Gearing Between the Hands

The minute hand of the clock is a 2" Strip bolted to the end of a Crank. The 12 to 1 reduction between the minute and hour hands is effected by means of four gears, namely, three 2 to 1 gears ($\frac{3}{4}$" Pinions and 50-teeth Gears) and one 3 to 2 (1" Gear and 57-teeth Gear). The final wheel of the series is the 57-teeth Gear, which revolves loosely on the axle of the minute hand, and the hour hand is a 2" Strip bolted to one of its holes, so that, as in an ordinary clock, the two hands revolve on a common axle. The train of gears connecting the hands is shown on the left in Fig. 2.

Out of sight behind the face there is a counterpoise (13 in Fig. 2) for the minute hand. As shown in Fig. 2 it has just passed the horizontal on its way down, and thus corresponds to the position of the minute hand as seen in Fig. 1, viz., just past the quarter on its way up.

The setting of the hands to the correct time is effected by means of a train of three Bevel Gears (14, Fig. 2) connected to the spindle of the minute hand, two facing each other and the third, with its axis in a horizontal plane, between the other two. The horizontal Bevel can be moved in or out of gear with the other two by means of a system of levers controlled by a key conveniently placed on the front of the clock under the face.

Of the vertical pair one is connected with the drive and the other with the hands, and therefore by depressing the key the hands are freed.

(To be continued).

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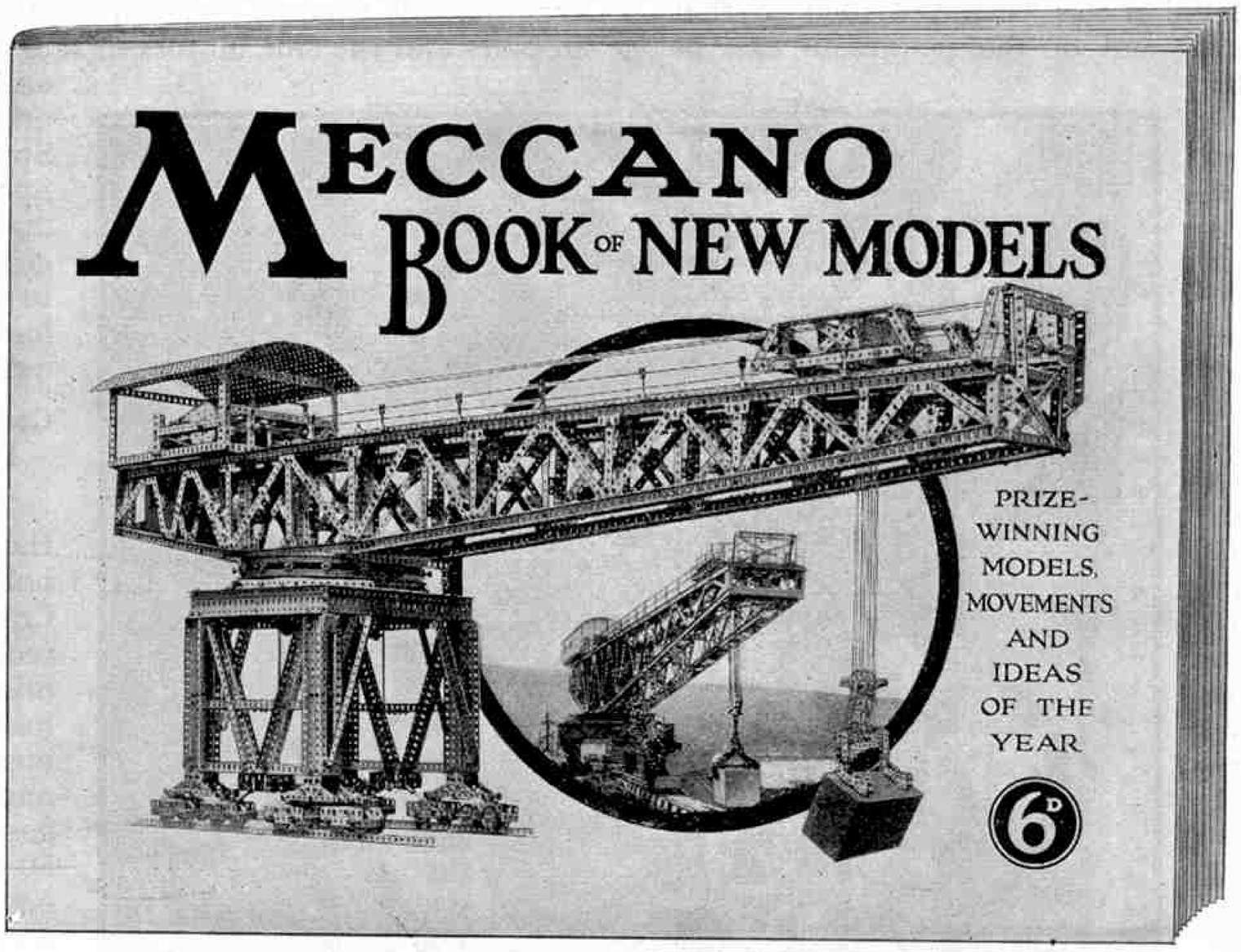

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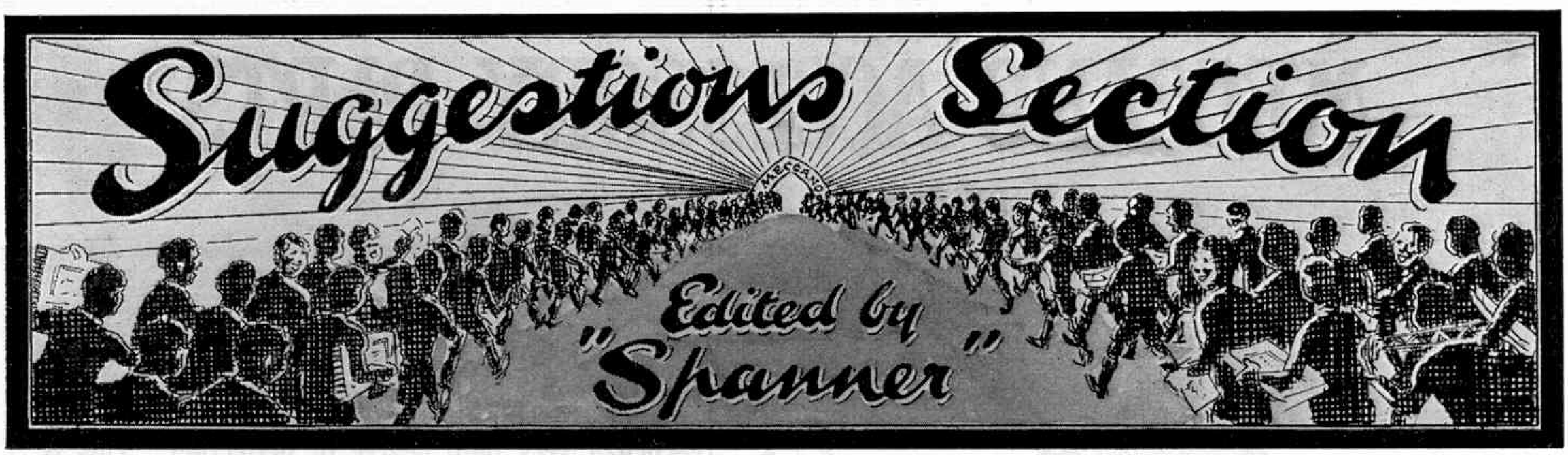


(200)—A Novel Pistol

(H. Tizzard, Bath)

An unusual type of Meccano Pistol is illustrated in Fig. 200. The novel feature lies in the fact that instead of employing Collars or Washers as missiles, a length of Spring Cord or an elastic band is used. For this reason the pistol is quite suitable for the younger Meccano boys for, although it shoots accurately through considerable distances, it cannot easily cause serious damage.

The actual construction of the model should not prove difficult if the illustration be examined carefully. It will be seen that the handle is composed of four 4½″ Angle Girders secured to the rear end of the "barrel" of the pistol, and that the barrel consists of two 12½″ Angle Girders. The front ends of the latter are secured to a 1″ Triangular Plate.

The release mechanism is constructed as follows: A Small Fork Piece is mounted pivotally on bolts that are inserted in the grub-screw holes of a Crank 1, which is attached to the pistol by Double Brackets and 1½″ Angle Girders. A Rod 2, sliding in the boss of the Crank, carries on its lower end a Worm, while its upper end enters the boss of the Small Fork Piece. The Worm engages with a ½″ Pinion on a short transverse Rod that is journalled in the 12½″ Angle Girders and to which the trigger 4 is attached by means of a Coupling 3.

The loop of Spring Cord is stretched between the 1″ Triangular Plate and the boss of the Small Fork Piece, so that on pressing the trigger the Rod 2 moves downward out of contact with the boss of the Small Fork Piece, which then falls forward and releases the "missile."

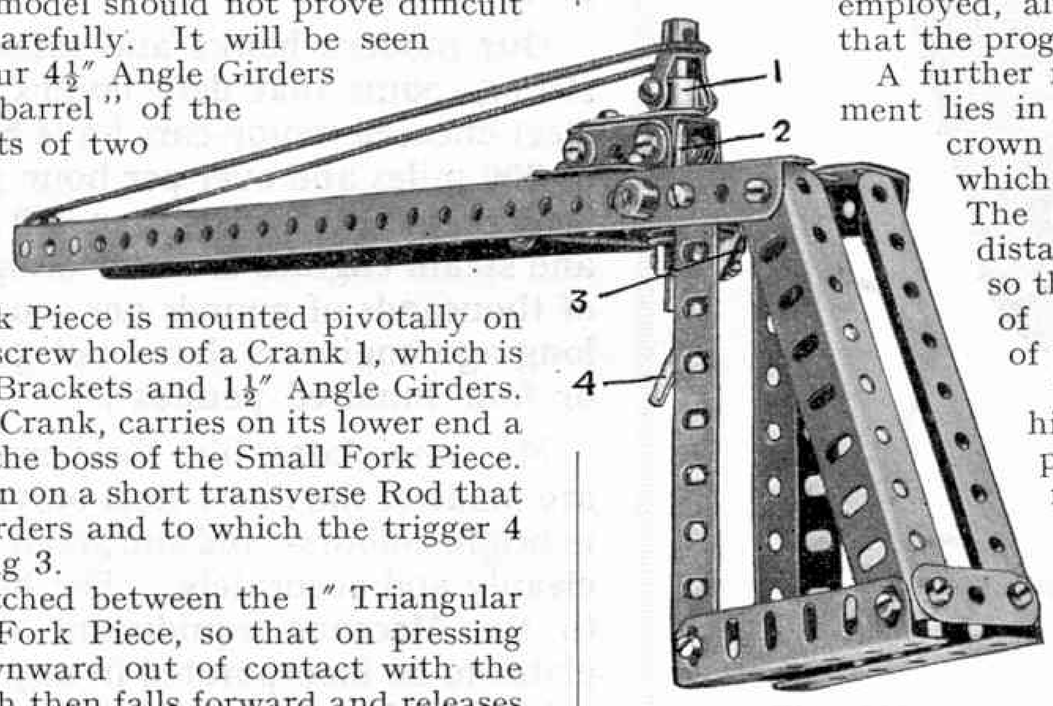


Fig. 200

(201)—Further Improvements to the Meccanograph

In the Suggestions Section for May we described a new movement that, when fitted to the Meccanograph, enables many additional designs to be produced with this interesting machine. The article aroused a great deal of interest, and since the Meccanograph appears to be more popular than ever we give particulars of further novel "gadgets" that have recently been added to it by contributors.

The Meccanograph shown in Fig. 201 was built by E. Bradshaw (Leeds) for participation in a recent special Meccanograph design contest, and whilst it broadly resembles the standard instrument, a close study of the illustration will reveal many novel features.

For example, instead of the paper being pinned to the Designing Table, it is held by clamps composed of 5½″ Strips that are pressed down by further Strips, which are bent slightly to form springs. These springs are bolted to 5½″ Strips 1, each of which is attached at one end to a Hinge while its other end is held under one arm of a Bell Crank that is secured to the Table by a wood-screw passed through its boss. By turning the Bell Cranks, the ends of the Strips are released, thereby permitting the paper to be removed. This method of fastening the sheets of paper to the Table is not only quicker and more efficient, but it prevents the corners of the Table becoming damaged through numerous insertions of drawing pins.

Another point to notice is that the designs are traced through a sheet of carbon paper on to the paper beneath by a pointed steel rod (a Meccano Axle Rod filed down) that takes the place of the pencil. The lines traced in this manner are very fine and do not become thick or broken as is the case when a pencil or ordinary pen is employed, although a disadvantage lies in the fact that the progress of the design cannot be observed.

A further improvement over the standard instrument lies in the fact that the Bush Wheel of the crown head is replaced by a Face Plate 4, to which are fixed two or more Threaded Pins. The latter may be arranged at varying distances from the centre of the Face Plate, so that the writing arm 2 receives a number of varying impulses for each revolution of the crown head.

The writing arm is in two portions, hinged together, so that the upper portion 2 carrying the writing point may be readily swung upwards clear of the Designing Table when changing the paper. The pointed rod is kept in firm contact with the paper by a weight consisting of a 1⅛″ Flanged Wheel and a Worm placed on the Rod itself. The Bush Wheel 3 operates a band brake on the Designing Table shaft, the purpose of which is to counteract the effect of "backlash" as explained in Suggestion No. 193.

Another very ingenious modification, by means of which an entirely new range of designs may be produced with the Meccanograph, has been introduced by R. Pearse (Kingston, Surrey). This consists of an epicyclic gear incorporated in the drive to the Designing Table. The Table is secured to a shaft that is journalled in one hole of a 3½″ Gear Wheel, which is free to rotate about a fixed vertical Rod. The latter Rod carries the "sun wheel" and the former Rod the "planet wheel," so that by rotating the 3½″ Gear Wheel, the planet wheel is caused to travel round the immovable sun wheel, and consequently the Table is caused to turn about its own centre as well as to travel bodily round the fixed vertical Rod. The gear ratio between the fixed and moving Rods may be varied by substituting sun and planet wheels of different sizes. This epicyclic gear is similar to the mechanism incorporated in the Two-speed Planetary Gear Box described under S.M. 84 in the Standard Mechanisms Manual (see page 17), and this should be referred to when building the gear.

To any readers who are as yet unacquainted with the Meccanograph, we would mention that full details for building this model are contained in the Special Instruction Leaflet No. 13, which may be obtained from any Meccano dealer, or post free from this office, price 3d.

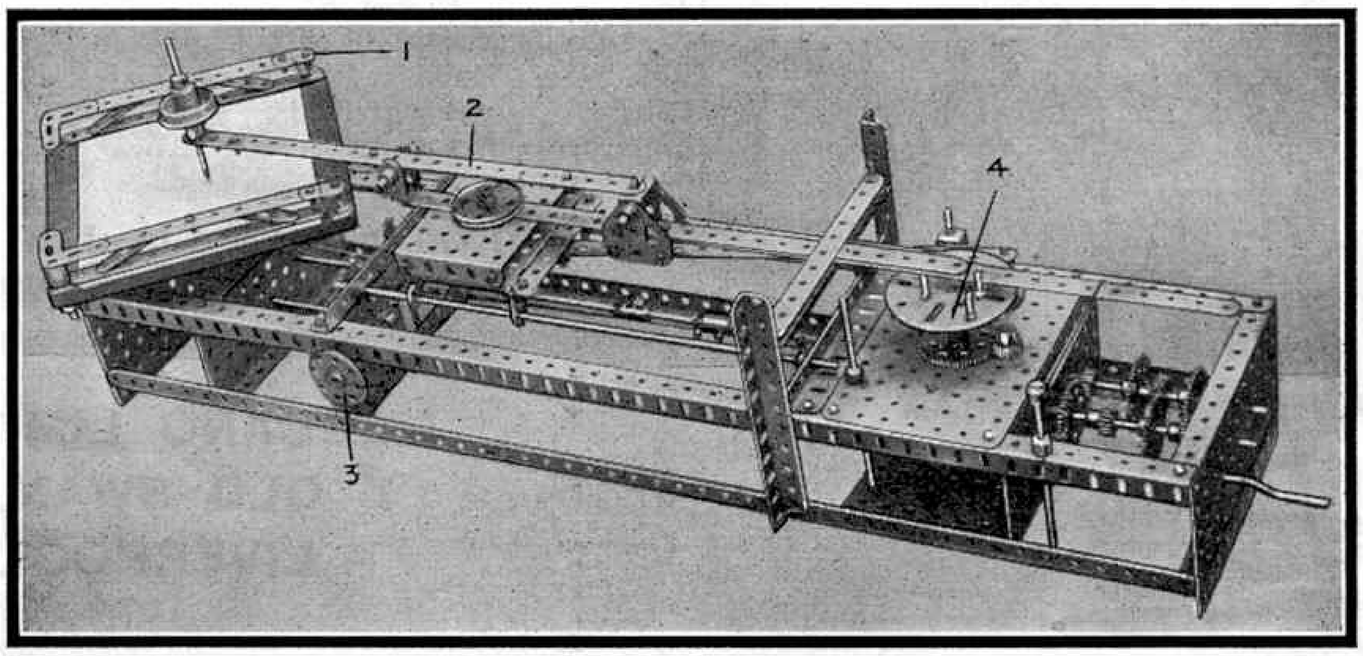
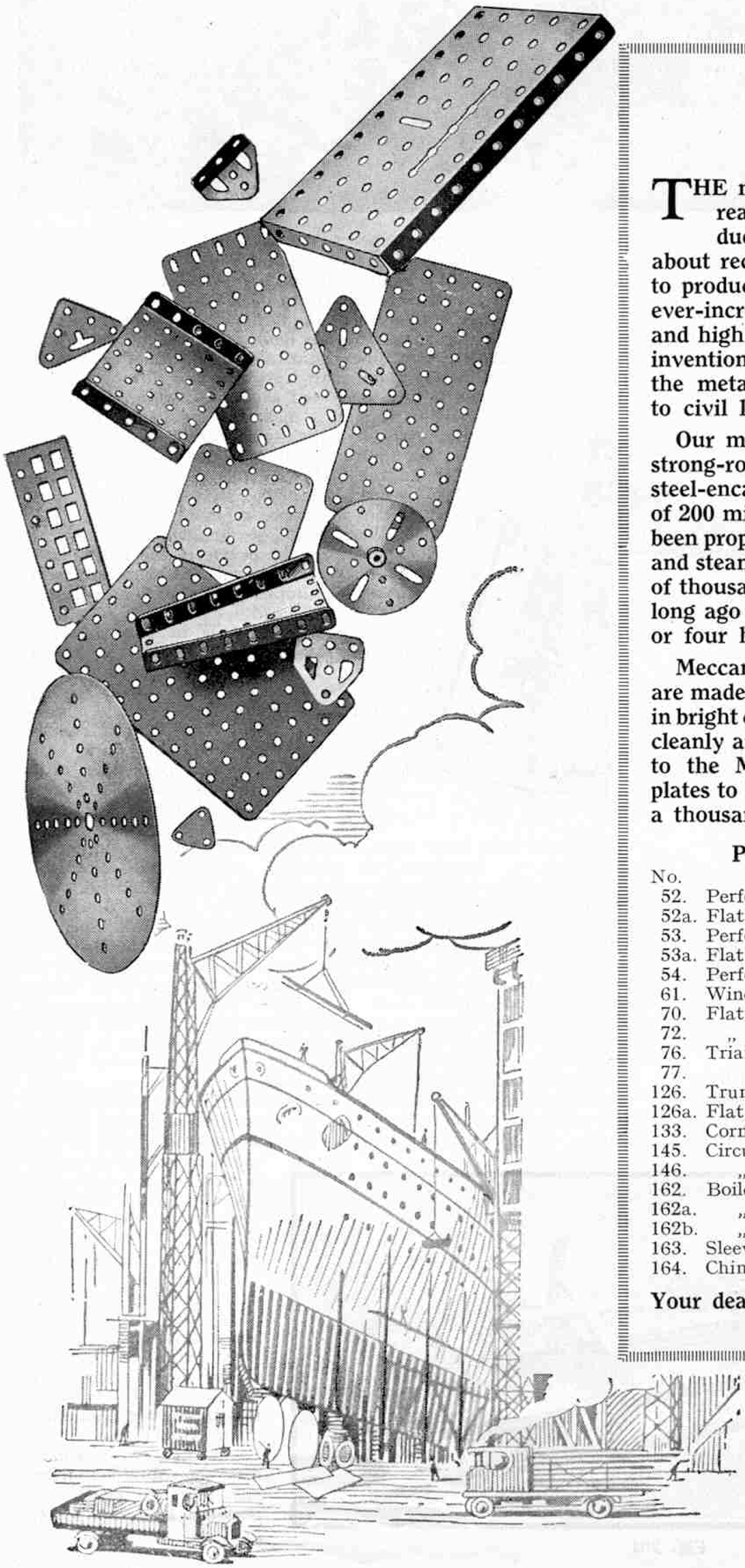


Fig. 201

MECCANO ACCESSORY PARTS



2. Plates

THE manufacture of steel plates in actual practice has reached a very high degree of perfection. This is due chiefly to the amazing developments brought about recently by the different nations in their endeavour to produce plates of sufficient toughness to withstand the ever-increasing power of enemy armour-piercing projectiles and high explosive shells. Fortunately, however, the new inventions and improved methods of preparing and rolling the metal thus brought to light are also being adapted to civil life.

Our modern banks and safe-deposits are provided with strong-rooms that defy bombs, burglars, fire and floods ; steel-encased motor-cars have been built to travel at speeds of 200 miles and over per hour ; all-metal aeroplanes have been propelled at more than 350 miles per hour ; and boilers and steam engines are now designed to withstand pressures of thousands of pounds per square inch, although not very long ago engineers dared not go beyond pressures of three or four hundred pounds !

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No.			s.	d.
52.	Perforated Flanged Plates, 5½″ × 2½″, ½″ Flanges...	each	0	5
52a.	Flat Plates, 5½″ × 3½″	„	0	5
53.	Perforated Flanged Plates, 3½″ × 2½″, ½″ Flanges...	„	0	3
53a.	Flat Plates, 4½″ × 2½″	„	0	3
54.	Perforated Flanged Sector Plates	„	0	3
61.	Windmill Sails	4 for	0	6
70.	Flat Plates, 5½″ × 2½″	each	0	4
72.	„ „ 2½″ × 2½″	„	0	2
76.	Triangular Plates, 2½″	„	0	2
77.	„ „ 1″	„	0	1
126.	Trunnions, 1″ deep, ½″ flange	„	0	2
126a.	Flat Trunnions, 1½″ × 1½″	„	0	1
133.	Corner Brackets	„	0	1
145.	Circular Strips, 7½″ diam. over all	„	0	9
146.	„ Plates, 6″ „	„	1	0
162.	Boiler, complete with Ends...	„	1	0
162a.	„ Ends	„	0	3
162b.	„ without Ends	„	0	6
163.	Sleeve Pieces	pair	0	6
164.	Chimney Adaptors	each	0	2

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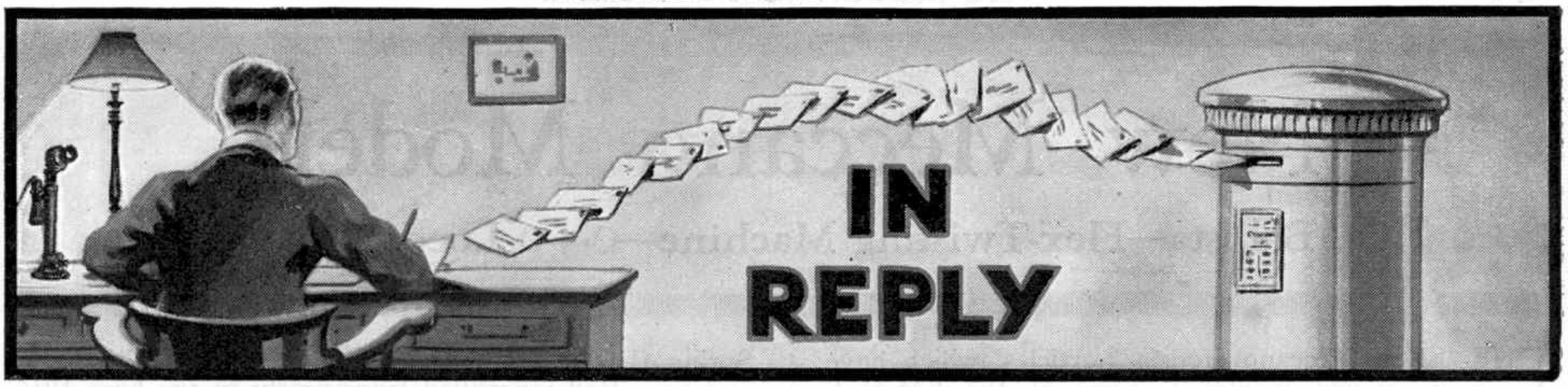
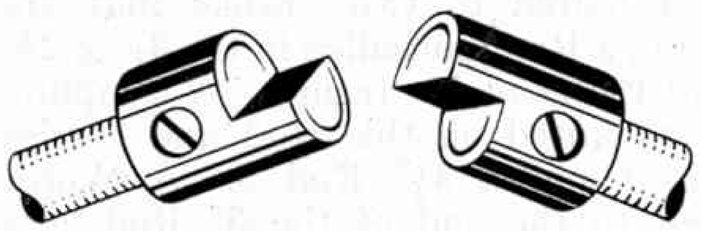


In this page, month by month, we reply to suggestions regarding improvements or additions to the Meccano system. We receive many hundreds of these suggestions every week, and consequently we are able to publish only ideas that show particular interest or ingenuity. Suggestions submitted for consideration in this section must be written on a separate sheet of paper and the name and address of the sender must appear on each sheet used. Envelopes should be addressed to "Suggestions," Meccano Ltd., Binns Road, Old Swan, Liverpool.

NEW DOG CLUTCH.—We are afraid that it would not be advisable to introduce your suggested dog clutch coupling unit. This, as will be seen from the sketch, would comprise two identical portions, drilled and tapped so that they might be secured on standard



Meccano Axle Rods, and a piece of metal of semi-circular section would be removed as shown. When the two portions were brought together the semi-circular pro ections would lock with each other and the equivalent of a continuous shaft would be formed ; the two portions could be brought out of engagement by means of a suitable withdrawal mechanism. We agree that it might be possible to produce this type of dog clutch slightly cheaper than the existing pattern owing to the fact that both sections would be identical, but the unit would not be efficient in action. It would be necessary to journal the rods carrying the members of the clutch very rigidly as the slightest amount of "play" would result in leverage between the "flats" of the sections and consequent loss of power. The action of engagement and disengagement would also be very "jerky" and for these reasons we consider it best to retain the existing pattern of clutch. (*Reply to R. Horsham, Hornchurch*).

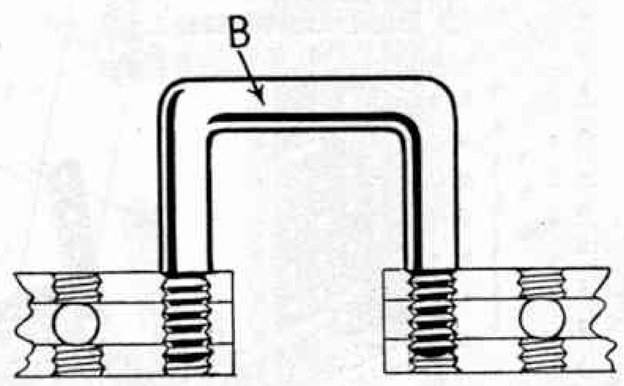
FLANGES ON CLOCKWORK MOTOR.—If flanges were added to the side plates of the Clockwork Motor they would certainly facilitate the securing of the unit to a baseboard. The Clockwork Motor is very often required to be secured in a horizontal position in mobile and stationary models, however, and if flanges were provided on any of the sides they would prevent this being done. We therefore consider it a better plan to retain the existing pattern of side plates and to bolt Angle Girders, etc., to them when it is required to mount the Motor in a vertical position. (*Reply to J. R. Skelton, London, E.C.6*).

NEW ANGLE BRACKETS.—There is no need for us to introduce Angle Brackets with lugs set at 135 and 45 degrees to each other as the existing Angle Brackets can be bent quite easily to form your suggested parts. (*Reply to Gilman Clark, Oil City, Pa., U.S.A.*).

IMPROVED THREADED PIN.—Owing to the fact that it is one of the most versatile accessories in the system, the Threaded Pin (part No. 115) comes in for a considerable amount of interesting criticism from model-builders who would like to make the Pin even more adaptable than it is at present. We are afraid, however, that your proposed modification to this part would not constitute an improvement. Your idea, as will be seen from the accompanying sketch, would be to cut a standard thread A for a short distance on the shank of the Pin. A Pulley, Gear Wheel, etc., could then be mounted loosely on the plain portion of the Pin and at the same time could be prevented from slipping off by a nut B screwed on to the threaded portion A. It is doubtful if this would prove of any advantage, however, as it is already a very simple matter to secure parts loosely on the Pin by fixing a Collar on the end of the shank. The extra threading operation would cause an increase in the cost of production of the Pin, while the thread would be liable to affect the utility of the complete article in a number of models. Consequently we cannot consider putting this scheme into practice. (*Reply to R. Nichols, Leytonstone, E.11*).

NEW STEAM PLANT.—Your suggestion that we should manufacture a special steam cylinder unit and separate boiler for generating steam is interesting and presents possibilities. The advantage of this scheme would be that the engine crankshaft could be fitted close to the position where the driving force was required and complicated transmission gearing would thus be avoided. There are, however, several grave drawbacks to the idea. If the cylinder block and the boiler were placed at any great distance apart efficiency would be lowered, for the steam would cool or even condense before reaching the cylinder. Also, if the boiler and cylinder units were to be placed in various positions, some form of flexible connection in the steam pipe would be necessary and loss of steam at the joint would be bound to result. We have not so far given any attention to the question of motors driven by water pressure, owing to the difficulty of obtaining suitable water supply, but we may be able to consider this scheme in the future. (*Reply to F. Anderton, York*).

CRANKSHAFT MEMBER.—Your proposed crankshaft member, which we illustrate herewith, is well thought out and possesses possibilities. As will be seen from the sketch the part would comprise a length of rod of standard size bent into the form of the letter "U" with each of the "legs" threaded for a short distance. In use, a Coupling would be screwed on to each leg and Axle Rods of suitable length secured in the bores of the Couplings. A complete crankshaft would thus be formed and a connecting rod, consisting of a Strip or Rod fitted with an End Bearing, could

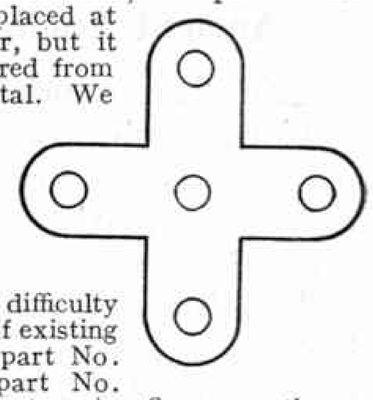


quite easily be slipped on to the portions B to complete the assembly. A part of this type would certainly enable a neater built-up crankshaft to be formed than would be possible by using Rods and Couplings throughout, but difficulty would arise in fitting a suitable "big end" bearing for the connecting rod in large models. For this reason we consider it better to build up crankshafts when required from standard parts (see Standard Mechanisms Manual, S.M. 274) or in the case of light models, the Meccano Crankshaft (part No. 134), which has a 1" stroke, can be used. (*Reply to E. Eaton, Aldenham*).

INSULATED BRACKET.—There would no doubt be quite a number of uses for Angle Brackets prepared from insulating material such as fibre or bakelite. In electrical models, particularly where the frame is used as the "ground" or return lead to the main battery, it is often required to insulate electrically one part from another and these brackets would consequently be very handy. It is possible at present, of course, to insulate two members from each other by a metal Angle Bracket held in place by 6 B.A. Bolts and Nuts passed through Insulating Bushes, but this arrangement is somewhat clumsy. We are considering your idea. (*Reply to W. Tryler, Southend-on-Sea*).

WATERPROOF MATERIAL.—Your suggestion that we should supply paper impregnated with wax or a similar substance so as to render it waterproof, is quite interesting, but it would not be advisable to do this as the special paper would have little if any application, as neither Meccano or Hornby accessories are designed for use with water or liquids of any kind. You should have little difficulty in obtaining waterproof paper, if specially required, from a stationer or department store that specialises in picnic accessories, for waxed paper cups, plates, and greaseproof wrapping materials are generally stocked by firms of this kind. (*Reply to L. Artzrouni, Paris*).

CROSS PIECE.—We have inspected your design for a new type of perforated connecting piece (see accompanying illustration) and consider this quite an interesting idea. As will be seen, the part would resemble two 1½" Strips placed at right angles to each other, but it would of course be prepared from one solid sheet of metal. We agree that a part of this nature might be used in structural work to join two Girders or Strips rigidly to each other at right angles, but we do not think that you should have much difficulty in doing this with the aid of existing parts (a Corner Bracket, part No. 133, or an Architrave, part No. 108, could be used, for instance). Consequently we do not consider your suggested part essential, but we are keeping the idea in mind in case a wider application can be found for it. (*Reply to E. Lower, Rawcliffe, near Goole*).

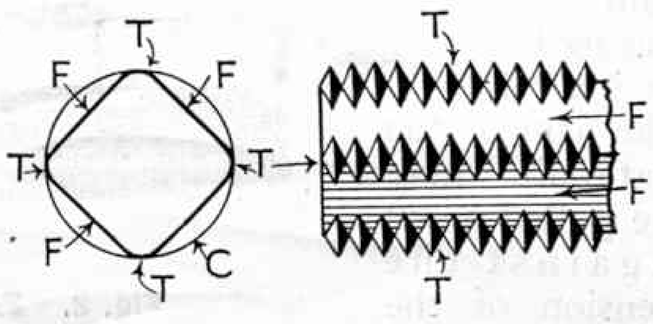


NEW FLANGED WHEEL.—We note your idea that a 4½" diam. flanged wheel should be introduced, but we do not consider this would be a suitable addition as very few uses could be found for the part. We agree that it could be employed as a locomotive driving wheel but this function is amply covered by the Face Plate used in conjunction with the Meccano Wheel Flange, or in the case of very large models by the 6" Circular Plate and Hub Disc, as in the Baltic Tank Locomotive (see Special Instruction Leaflet No. 15). (*Reply to I. R. Singh, Calcutta, India*).

GEAR RIM.—A slight economy in cost might be effected if the 3½" diam. Gear Wheel were manufactured as a perforated tooth ring without boss or centre part, the ring being mounted on a Rod by bolting it to a Face Plate, etc. A built-up gear of this type would not, however, be satisfactory as there would be great difficulty in centering the gear so that it would run "true." We do not consider it advisable to introduce a part of this type. (*Reply to J. Heath, London, E.18*).

NEW CORNER ANGLE BRACKET.—We have inspected your idea for a new type of corner angle bracket which you consider should be introduced into the Meccano system. Your suggested part would resemble the existing Corner Brackets (parts Nos. 154a and 154b) with the exception that each would be fitted with larger lugs in each of which two holes would be punched. There would be very little application for a part of this type, and we do not consider it advisable to introduce it to the system. (*Reply to J. Clayton, Baildon*).

ALTERED WINDING SPINDLE.—We were interested in your suggested method of providing "remote control" of the winding spindle of the Clockwork Motor. The principle of the idea will be understood from the accompanying sketches. The corners T of the square section winding shaft would first of all be turned down to the shape shown in the left-hand sketch, and standard Meccano threads would then be cut on the portions T as shown in the right-hand diagram. After making this alteration it would still be possible to slip the winding key on to the "flats" F of the spindle when it was required to wind up the spring of the Motor direct, while if it were necessary to perform the operation at a distance a Meccano Threaded Coupling could be screwed on to the Threads T and a suitable length of Threaded Rod attached to the Coupling to do duty for the winding key. We hope to consider this idea from a practical standpoint in the near future, as it certainly possesses possibilities. (*Reply to C. W. Price, Beckenham*).



New Meccano Models

Ballista—Flex-Twisting Machine—0-4-0 Locomotive

THE "New Meccano Models" articles, which have now become regular features of the *"M.M.,"* provide striking proof of the statement that "the number of models that can be built with a Meccano Outfit is unlimited"! Although the series has been running now for over two and a half years, every model shown has been of an entirely original nature.

An Ancient Engine of War

The first model to be described this month is an ancient engine of war known as the "ballista," a relic of the days when our forefathers added variety to a battle by pelting each other with lumps of rock! In operation it resembles a giant catapult.

The Meccano ballista is quite simple to build but it is very efficient in operation, and will throw marbles or small pieces of wood, etc., through considerable distances. As is usual when describing models of this type, we would remind readers not to use any heavy or dangerous missiles, or at least not to fire the machine in spaces where there is likelihood of damage to windows or even to fellow constructors!

The frame of the ballista consists of two $12\frac{1}{2}''$ Angle Girders held apart at front and rear by $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates. A further pair of $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates are bolted in an upright position at the rear and two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates are also secured to the Angle Girders near the front. The last mentioned Plates form supports for a $4\frac{1}{2}''$ Axle Rod upon which the ballista arm is pivoted. The arm itself is built up from $5\frac{1}{2}''$ and $12\frac{1}{2}''$ Strips bolted at the ends to Double Brackets and braced at the centre by a $1\frac{1}{2}''$ Double Angle Strip. Four $5\frac{1}{2}''$ Strips are attached to the arm as shown and bolted rigidly to a Double Bracket, to which is secured a Flat Bracket 3. A Boiler End (part No. 161) is secured to the top of the arm to act as a receptacle for the missiles.

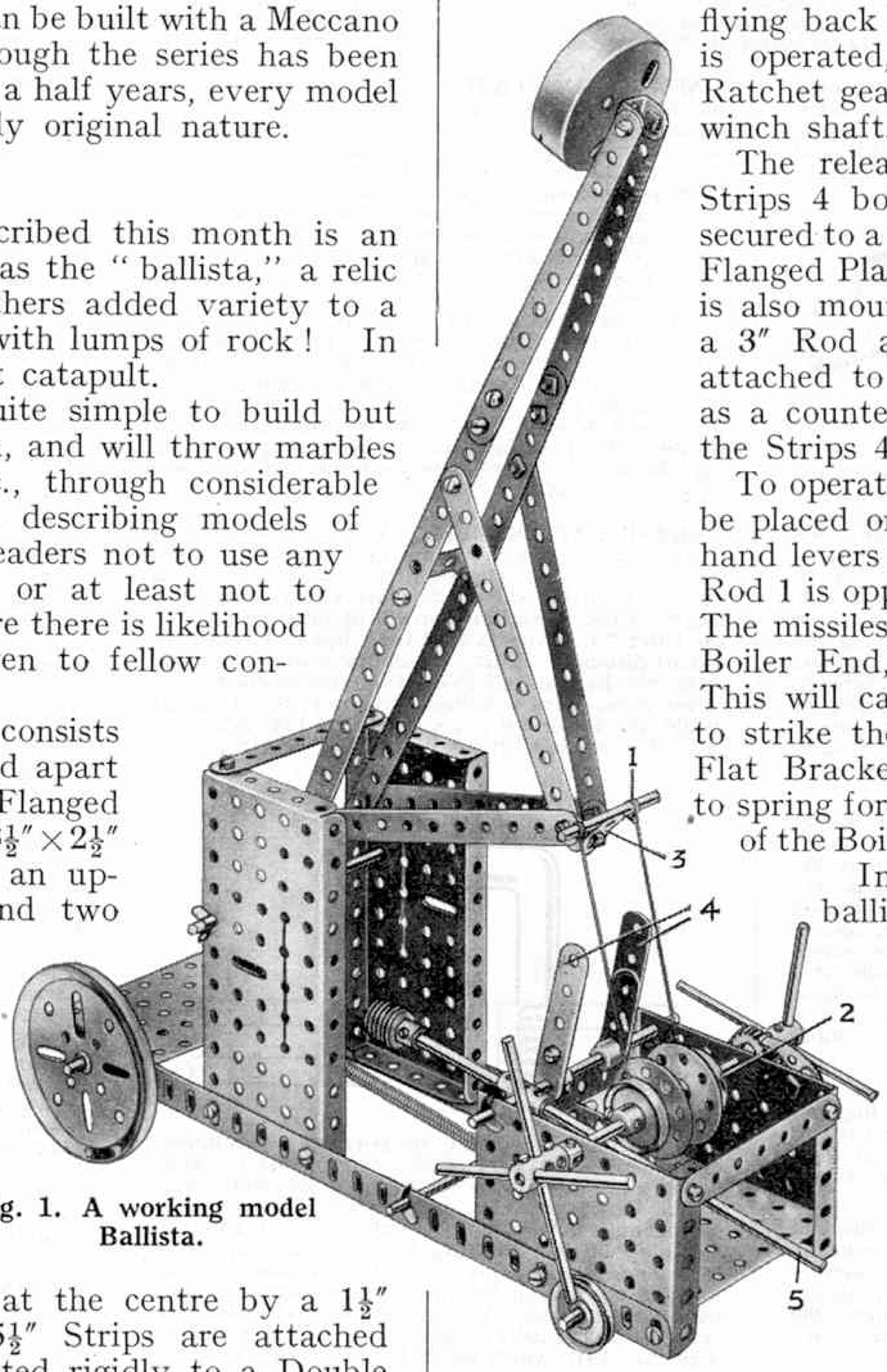


Fig. 1. A working model Ballista.

Two equal lengths of cord are attached to each end of the $1\frac{1}{2}''$ Rod 1 and to the winch 2, which is operated by the hand levers secured at each end. By placing the Rod 1 over the end of the Flat Bracket 3 and rotating the winch the arm of the catapult may be pulled down against the tension of the Spring that is secured to the lower end of the arm and to a Rod journalled transversely in the base $12\frac{1}{2}''$ Girders. The arm is prevented from flying back before the release mechanism is operated, by means of a Pawl and Ratchet gear mounted on one end of the winch shaft.

The release gear consists of two $2\frac{1}{2}''$ Strips 4 bolted to two Cranks that are secured to a Rod journalled in the $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates of the frame. A Coupling is also mounted on this Rod and carries a 3" Rod and a $4\frac{1}{2}''$ Rod 5. A Worm attached to the end of the 3" Rod acts as a counterbalance that normally keeps the Strips 4 nearly vertical.

To operate the model, the Rod 1 should be placed on the Flat Bracket 3 and the hand levers of the winch turned until the Rod 1 is opposite the ends of the Strips 4. The missiles may then be loaded into the Boiler End, and the Rod 5 depressed. This will cause the ends of the Strips 4 to strike the Rod 1 and push it off the Flat Bracket 3, thus allowing the arm to spring forward and project the contents of the Boiler End in the desired direction.

In order to build the model ballista the following parts are required:—

2 of No. 1; 6 of No. 2; 4 of No. 3; 2 of No. 5; 2 of No. 8; 1 of No. 10; 3 of No. 11; 3 of No. 15; 4 of No. 15A; 4 of No. 16; 2 of No. 17; 2 of No. 19B; 4 of No. 22; 2 of No. 24; 1 of No. 32; 6 of No. 35; 36 of No. 37; 2 of No. 37A; 4 of No. 38; 1 of No. 43; 1 of No. 48; 2 of No. 52; 4 of No. 53; 1 of No. 57; 3 of No. 59; 2 of No. 62; 3 of No. 63; 1 of No. 147A; 1 of No. 147B; 1 of No. 148; 1 of No. 162A.

Flex-twisting Machine

In models propelled by the Meccano Electric Motor or in which electric current is used in some way, it very often is required to connect the Accumulator or Transformer at a distance, and a double length of flexible wire must consequently be used. When two separate wires are employed for this purpose the result is often unsightly, and the little machine shown in Fig. 2 should therefore be of practical value, for with its aid it is possible

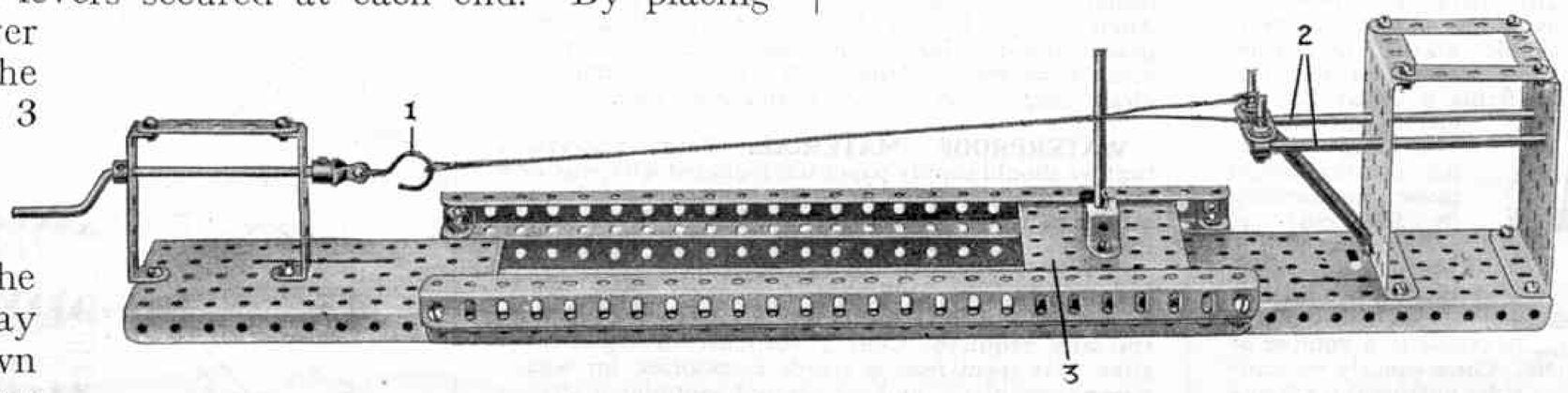


Fig. 2. Flex-twisting Machine, with length of partly completed flex in place.

to twist two separate lengths of flexible wire together quickly and neatly so that they form a duplex cable.

The base of the machine consists of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates connected together by a pair of $12\frac{1}{2}''$ Angle Girders, and a second pair of Angle Girders are attached by means of Angle Brackets so as to form channels in which the $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 3 may slide. Two $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates are bolted in an upright position to one of the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates and two $4\frac{1}{2}''$ Rods 2 are placed as shown so that they can slide longitudinally. A Collar is mounted on the end of each of the Rods 2 and a $1\frac{1}{2}''$ Strip held in place between the Collars by means of Threaded Pins, which are secured in the threaded bores of the Collars. At the left-hand end of the machine, a Crank Handle fitted with an End Bearing and Hook 1 is journalled in two Double Angle Strips.

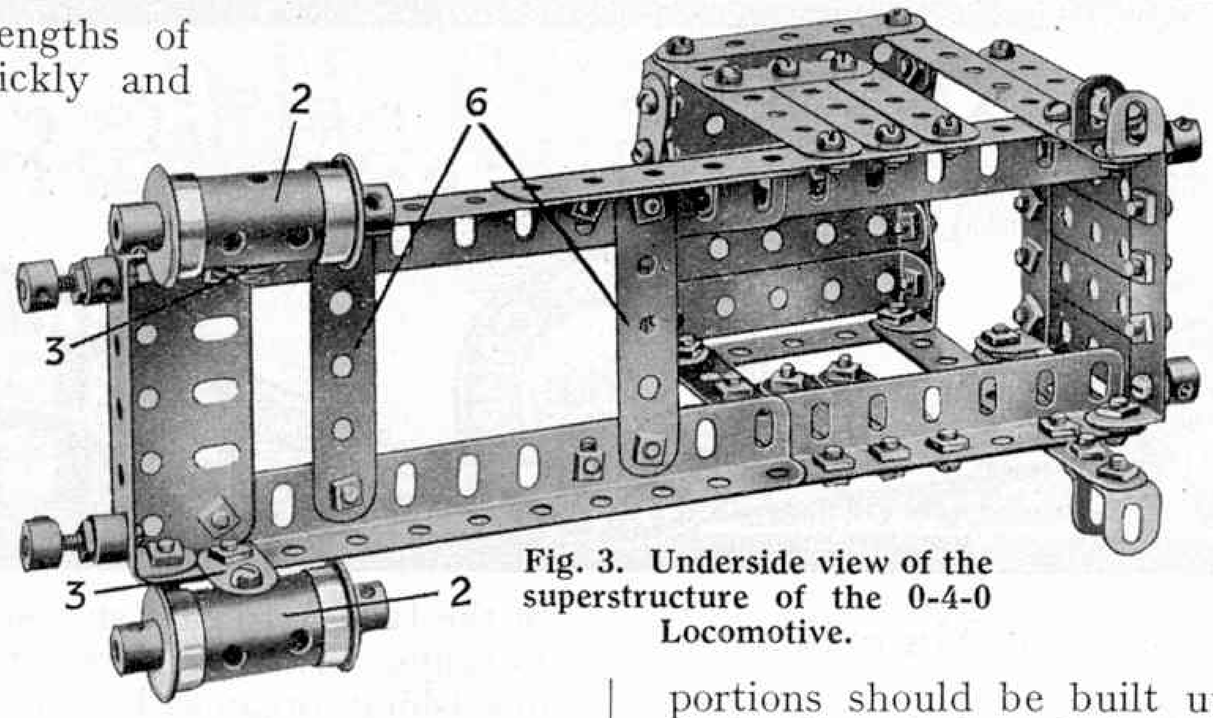


Fig. 3. Underside view of the superstructure of the 0-4-0 Locomotive.

In order to prepare a piece of twin flex, the two wires should first of all be rigidly secured to the Hook 1 and then passed on either side of the Axle Rod mounted on the Plate 3 and finally secured to the Threaded Pins fitted to the ends of the Rods 2. The Plate 3 with the Axle Rod attached should be pushed up close to the Hook 1 and the Crank Handle then turned so as to twist the wires together. As the twisting operation proceeds, the Rod attached to the Plate 3 will be pushed ahead of the flex while the shortening of the wires through twisting will cause the Rods 2 to slide forward against the tension of a Spring, and in this way a uniform finish is given to the flex.

The parts necessary in the construction of the model are as follows:—

3 of No. 5; 1 of No. 6A; 4 of No. 8; 4 of No. 12; 2 of No. 15A; 1 of No. 16; 1 of No. 19S; 2 of No. 35; 32 of No. 37; 2 of No. 38; 1 of No. 43; 1 of No. 45; 2 of No. 48A; 2 of No. 52; 3 of No. 53; 1 of No. 57; 3 of No. 59; 2 of No. 115; 1 of No. 166.

0–4–0 Shunting Locomotive

The railway locomotive always forms a popular subject in the range of transport vehicles that can be reproduced with Meccano and the neat model 0–4–0 shunting engine illustrated in Fig. 4 should appeal particularly to many constructors.

The model represents a type of small locomotive often found in goods yards and works sidings, and although quite small it possesses a surprising degree of realism, the Meccano Boiler, Chimney Adaptor, and Sleeve Pieces proving of considerable assistance in achieving the finished effect.

The model consists of two main units, the superstructure, comprising the boiler, cylinders and cab, and the frame or under-carriage, incorporating the driving wheels and connecting gear, and these portions should be built up separately and fitted to each other on completion.

The superstructure is shown in detail in Fig. 3. Each of the two side members is built up from two $5\frac{1}{2}''$ Angle Girders overlapping five holes. The cab roof is composed of five $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips bolted to two $2\frac{1}{2}''$ Curved Strips and the roof is attached to the frame of the cab by Angle Brackets. The front of the cab is composed of three $2\frac{1}{2}''$ Strips connected together so as to form three sides of a square and bolted to the Boiler by an Angle Bracket. The cylinders 2, which consist of Sleeve Pieces with $\frac{3}{4}''$ Flanged Wheels pushed on to their ends, are bolted to the side members by means of two Flat Brackets 3 that are bent slightly outward.

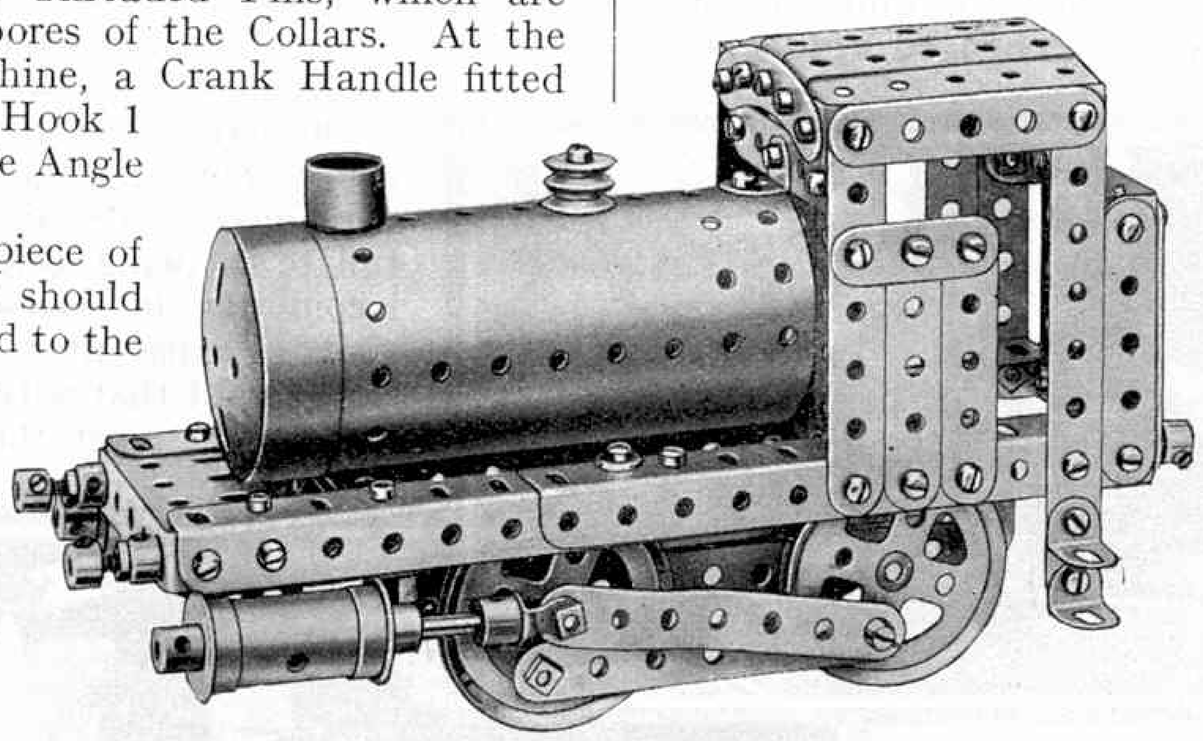


Fig. 4. A neat model 0-4-0 Shunting Locomotive.

The frame or under-carriage is illustrated separately in Fig. 5. Each side of the frame that carries the wheels is composed of two $5\frac{1}{2}''$ Strips overlapping seven holes and one $5\frac{1}{2}''$ Strip attached by Flat Brackets 4 as shown in Fig. 5.

The coupling rods 7 are attached to the front pair of wheels by bolts and lock-nuts and to the back pair by $\frac{3}{8}''$ Bolts and lock-nuts. The connecting rods 8, which are bent slightly as shown, are attached at one end to the Bolts 9 and at the other to End Bearings in which are secured the $1\frac{1}{2}''$ Rods that form the piston rods.

To assemble the model, the Bolts 5 are passed through the centre holes of the $2\frac{1}{2}''$ Strips 6, and through the Boiler, and are then secured by their nuts (the Washers shown being used to space the Strips 6 from the $1\frac{1}{2}''$ Double Angle Strips).

The parts used in the construction of the model locomotive are as follows:—

6 of No. 2; 2 of No. 2A; 6 of No. 3; 18 of No. 5; 2 of No. 6A; 4 of No. 9; 6 of No. 10; 10 of No. 12; 4 of No. 17; 4 of No. 20A; 4 of No. 20B; 2 of No. 23; 85 of No. 37; 15 of No. 37A; 10 of No. 38; 7 of No. 48A; 6 of No. 59; 2 of No. 90; 1 of No. 103F; 2 of No. 111; 5 of No. 111c; 1 of No. 116A; 1 of No. 162; 2 of No. 163; 1 of No. 164; 1 of No. 166.

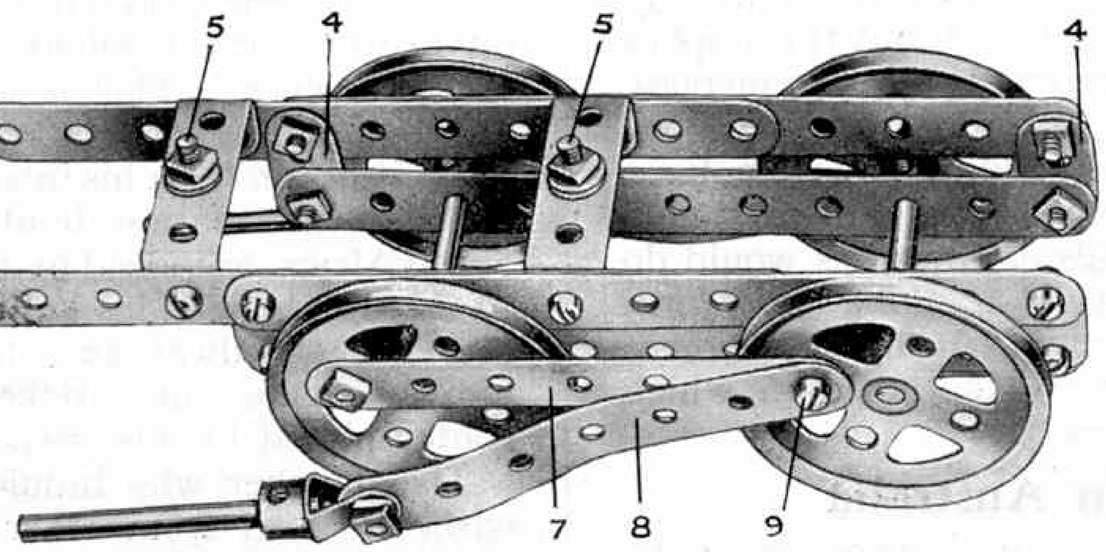
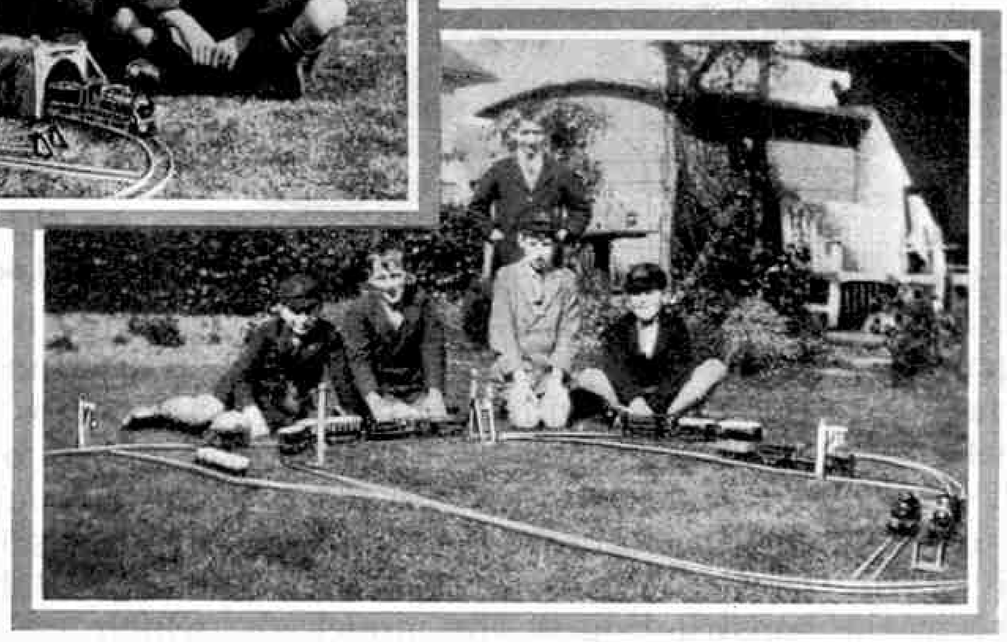


Fig. 5. Under-carriage of Locomotive, showing coupling gear.

Care of Branch Railway Material

During August a very large proportion of members of the Branches may be absent on holiday, and those who are not so fortunate find compensation in visits to locomotive sheds and other places of railway interest. This means that the time devoted to track work is reduced, and it may even happen that the Branch railway material remains untouched for quite a considerable time, while members are engaged outdoors.

If the programme arranged is of the character suggested above, care should be taken that locomotives and all rolling stock are carefully and neatly packed away in order to prevent deterioration. Everything should be carefully cleaned and particular attention should be paid to the removal of dirt and excess of oil from the mechanisms of locomotives. The rails should be carefully wiped clean of any oily deposit and before they are put away loose spikes and rail connecting plates should be attended to in order that these may not be missing when the day comes for re-assembly of the layout.



Sunny days in the garden. In fine weather members of the First York Branch, No. 118, enjoy their hobby in ideal surroundings.

Toward the end of the month, or early in September, when interest in indoor work revives, the task of overhauling material and planning a layout for use during the winter sessions arises. In laying down any miniature railway forethought should be exercised, but this applies particularly to Branch work, for in most cases an increase of membership is looked for and extensions will be required. The accommodation of additional locomotives and rolling stock is almost impossible on a badly designed track, and for this reason officials of Branches would do well to take an early opportunity of thinking out a form of layout that may readily be extended when it becomes necessary or advisable to increase the scale on which operations are conducted.

Railway Visits in Australia

From Australia comes a very striking instance of the readiness of responsible railway officials to help members of the H.R.C. to gain an insight into the working of real railways. This concerns the Westralian Branch, a flourishing organisation of keen H.R.C. members in Perth, West Australia. The Hon. E. A. Evans, M.Inst.M.E., Commissioner of the Western Australian Government Railways, who takes a great interest in the affairs of the Branch, has very kindly arranged a series of visits to railway departments in the neighbourhood, and one of the photographs that appear on the opposite page shows a group of members of the Branch on the way to the Government Railway Workshops at Midland.

On arrival the members were shown through every shop and the work carried on in it was explained in detail. They were specially fortunate in being able to see a new "Garratt" locomotive in course of construction. Other visits of equal interest are to be made and there is no doubt that with the kindly co-operation of the Commissioner, the members of the Westralian Branch will acquire an unrivalled knowledge of the requirements of modern railways.

An Interesting Hobby

The Correspondence Club of the Hornby Railway Company continues to grow in a satisfactory manner, but I am looking forward to a very large increase in the number of those who take advantage of the facilities offered. At the present moment correspondents in France, India and Canada are wanted, chiefly by members in Great Britain and New Zealand.

One South African member of the Club who is looking for friends with similar tastes promises to be a very interesting correspondent, for his hobby is running a tourist agency! This is called the "See the World" Tourist Office, and its organiser obtains an immense amount of fun from his interesting game. His practice is to collect information about journeys by rail to any part of South Africa, or indeed by rail and sea to anywhere in the world, and he uses his knowledge of the service given by the various railway and steamship companies to enable him to make out "tickets" for wonderful journeys contemplated by his friends.

The member who indulges in this remarkable hobby wishes to hear from other members who would like to join in the fun. Those who desire to do so should write to me and I will endeavour to arrange an exchange of letters.

Branch Notes

FARNHAM GRAMMAR SCHOOL.—A trip to London's railway termini was made by the Chairman and members, Victoria, Paddington, Euston, St. Pancras, King's Cross and London Bridge being visited in rotation. Among the numerous interesting trains seen were *"The Golden Arrow"* and the *"Southern Belle"* at Victoria, the down *"Torbay Limited"* at Paddington, and the Merseyside Express, hauled by Locomotive No. 6110, *"Grenadier Guardsman"* "Royal Scot" class, arriving at Euston. A very interesting paper on *"Locomotives of the S.R. (Western Section)"* was given by the treasurer. Secretary: H. S. North, "Karind," Boundstone, Nr. Farnham, Surrey.

BLACKPOOL (NORTHERN SECTION).—The extensive outdoor layout is operated regularly. On it trains are now correctly controlled by signals and it is hoped very soon to instal colour light signalling. Miniatures of famous trains, including the *"Hook of Holland"* and *"Flying Dutchman,"* are regularly run to timetable. New members will be welcomed and boys desiring to join should write to the Secretary. Secretary: A. Ian Howarth, 19, Westcliffe Drive, Layton, Blackpool.

SOLIHULL.—During summer regular visits are being made to Solihull Station, where new buildings are being erected. The steam excavator and the contractor's railway attract members' special attention. Secretary: Hugh Aitken, "Cardross," Broad Oaks Road, Solihull.

WIMBORNE GRAMMAR SCHOOL.—Some very interesting improvements have been made to the Branch layout, the ordinary signalling system having been supplemented by colour light signals. The mechanical signals are now controlled from each station by means of levers and rods built up from Meccano parts. The track and stations also have been remodelled. A Junior Section is to be started. This will meet on special Junior Branch nights in order that the younger members may have good opportunities for track working. Secretary: A. M. Hooper, 98, Upper Shaftesbury Avenue, Highfield, Southampton.

NOTTING HILL.—Operations on an extensive garden layout are the principal feature of summer activities. A visit recently was paid to the Royal Oak Station of the G.W.R., where great interest was taken in the shunting operations in progress. Particular attention was paid to the 9.0 p.m. Mail Train, which was hauled by a locomotive of the "Star" class. The Old Oak Common Engine Sheds also have been visited. Secretary: Mrs. H. A. Sharp, 110, Cornwall Road, Notting Hill, London, W.11.

WEST KENT.—The Electrical Section have fitted the stations on the Branch layout with electric light, greatly to the delight of the miniature passengers who use them! The Chairman has presented to the Branch his own track and as a result the Branch layout has been considerably enlarged and improved. Secretary: F. R. Dubery, 48, Reddons Road, Beckenham, Kent.

IPSWICH.—The members have been divided into two sections called the "Air Brakes" and "Vacuum Brakes" respectively. At a recent meeting 303 trains were run—the Branch record being broken by 85 trains. Recent engine tests also were successful, five new records being set up. A number of very interesting lectures have been given on *"American Locomotives and Coaches"* and *"A Run by Train from Ipswich to Colchester."* The Branch now possesses 60 railway photographs and 400 railway newspaper cuttings. These have been carefully pasted into albums. A large goods yard has been constructed in order to facilitate the sorting of trains. Secretary: P. E. Buck, 10, Dial Lane, Ipswich.

KING'S NORTON.—The members have commenced making numerous useful accessories for the Branch layout. An electrical section has been formed, and its members have undertaken to fit railway carriages, signals, stations, etc., with electric light. The lines, locomotives and rolling stock are to be tested regularly once a month. Secretary: P. L. Hughes, "Merrie Meade," West Hill Road, King's Norton, Birmingham.

KING'S HEATH.—The Cycling Section have visited Lichfield, Nuneaton and Bromsgrove. At the last named station the famous 0-10-0 Lickey banker was seen, and members were allowed to walk along the line in order to secure photographs of it. A Photographic Section has been formed in conjunction with the Cycling Section, and its members intend to secure a complete record of activities during the outdoor season. Secretary: K. Icke, 65, Livingstone Road, King's Heath, Birmingham.

GLOUCESTER.—On a visit to the L.M.S. Locomotive Shed, keen interest was taken in several engines, particularly in No. 629, a new locomotive of the 2P class. Members were allowed on the footplate of several engines, including one that was in steam. The coal stage and repair shops were also inspected. The West Gloucestershire Power Station was visited, the turbines, dynamos and switchboard attracting special attention. When leaving each member was presented with a booklet describing the station and its work. Secretary: George T. Clark, 66, Falkner Street, Gloucester.

HAROLDWOOD.—The Branch has been divided into two sections, members of which make Meccano models and other accessories. Each month a new General Manager is appointed. This plan gives each member an opportunity of putting his own ideas into practice. Cricket now occupies members' attention. Secretary: C. L. Barber, "Beaurains," Church Road, Haraldwood, Essex.

(Left) A group of members of the St. Agnes Church (Hove) Branch, No. 104. The Branch holds its meetings in the crypt of St. Agnes' Church. (Below) Members of the Westralian Branch, No. 76, about to entrain for an interesting visit to the Government Railway Workshops at Midland, West Australia.

Further Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given here. All owners of Hornby trains or accessories are eligible for membership, and the various secretaries will be pleased to extend a warm welcome to all who send in their applications:—

BEDFORD—G. S. J. Evans, School House, 1, Warwick Avenue, Bedford.

BIRMINGHAM—F. L. Cole, 471, City Road, Edgbaston, Birmingham.

BIRMINGHAM—K. Simmonds, 95, Hunter Road, Gravelly Hill, Birmingham.

BRENTWOOD—G. T. Turner, "Ponsmere," 50, Western Avenue, Brentwood, Essex.

COVENTRY—E. S. Smith, 5, White Street, Coventry.

CREIGIAU—John Bradshaw, "Morven," Pantygored Road, Creigiau, Glam.

FALMOUTH—E. Brown, "Belgrano," Landsdowne Road, Falmouth.

LIVERPOOL—C. R. Williams, 134, Morningside Road, West Derby, Liverpool.

LONDON, N.W.1—T. Turner, 139, Camden Street, Camden Town, London, N.W.1.

MAIDSTONE—S. C. Wicks, 24, Marion Crescent, Plains Avenue, Maidstone.

PORTSMOUTH—D. Cole, 90, Emsworth Road, North End, Portsmouth.

SANDERSTEAD—D. Clark, 23, Heathhurst Road, Sanderstead, Surrey.

SWANSEA—L. T. Levitt, "Alpha House," Townhill Road, Sketty, Swansea.

WEALDSTONE—J. E. Skoyles, 30, Aberdeen Road, Wealdstone, Middx.

OVERSEAS

AUSTRALIA—P. Thompson, 20, Camden Street, S. Kilda, S.2, Victoria.

S. AUSTRALIA—J. Gent, 65, Rose Terrace, Wayville, S. Australia.

ORANGE FREE STATE—J. Wilks, 21, Symonds Street, Kroonstad.

TASMANIA—A. R. J. McKenzie, "Claremont," Abbott Street, Launceston.

Further H.R.C. Incorporated Branches

131. READING SCHOOL—John C. Rivett, West Wing House, Reading School, Reading.

OVERSEAS

130. WILLIAMSTOWN (VICTORIA)—Wm. Jamieson, 92, Osborne Street, Williamstown, W.16, Victoria, Australia.

MEMBERS OF THE H.R.C. ARE ENTITLED TO WEAR THIS BADGE WHICH IS BEAUTIFULLY ENAMELLED IN COLOURS

Hornby Railway Company

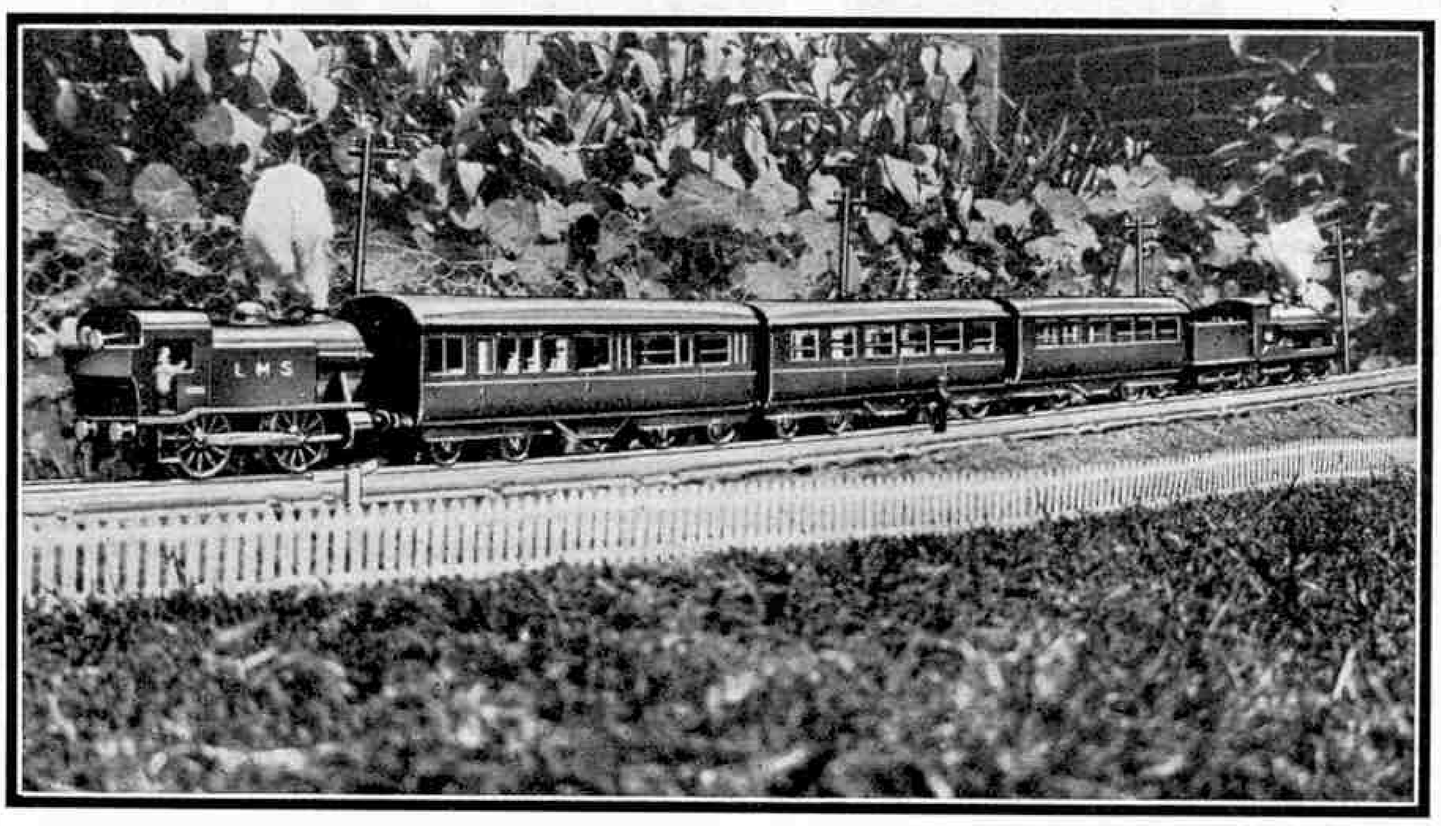
JUNIOR SECTION

XX.—Running a Garden Railway

MEMBERS OF THE H.R.C. ARE ENTITLED TO WEAR THIS BADGE WHICH IS BEAUTIFULLY ENAMELLED IN COLOURS

IN last month's article we dealt with the subject of miniature railways in the garden. There is no better way of combining an interesting occupation with health-giving exercise and outdoor fun than by constructing an outdoor layout. This may be made surprisingly realistic, and on it may be carried out operations that have the added interest of being of the open air type necessarily followed on real railways.

How to build up a railway in a garden was explained last month and the construction of such accessories as tunnels, embankments and cuttings also was described. Of course, these do not by any means exhaust the possibilities. For instance, a splendid representation of a really deep ravine may easily be made by means of a little spade work. In its turn this gives a splendid opportunity for designing a viaduct. The ravine may be of convenient length to be bridged by a Hornby Viaduct, but this does not represent the limit, for a splendid structure of almost any desired length may be built of Meccano parts.



A banking locomotive at work on a layout in the garden. An express train being given a friendly push up a steep gradient by a Hornby No. 1 Special Tank Locomotive.

Another plan that may appeal to the enthusiast is that of filling in a ravine or depression by building an embankment across it. In that case it is advisable to pierce the embankment in order to provide the means by which road traffic may pass underneath the line. As previously pointed out, care must be taken to make the ground sufficiently firm and solid to carry the weight of the trains passing over it, and the soil must be well pressed down in order that serious subsidences may be avoided.

Those who are really keen on obtaining realistic effects may go to the length of introducing a miniature river or canal. The only difficulty in following out this plan—apart, of course, from that of obtaining sufficient space—is to obtain suitable material for the bed. Ordinary soil is quite useless for this purpose, and a "river" flowing in a depression formed by simply digging a channel in the garden would quickly run dry! Clay well tamped down is the best material and a bed of this should prove sufficiently watertight to enable a satisfactory stream to be included.

Bridging a water course of the kind suggested provides an interesting problem in railway engineering. A wooden structure may be designed, but with the aid of Meccano parts a bridge of any type can be built and a representation of one that opens for the passage of river or canal traffic would add very greatly to the interest of operations. Designs for lifting and opening bridges of all types often have appeared in the pages of the "*M.M.*," and the miniature railway engineer will have little difficulty in building a model to suit his purpose.

A word of warning should be given here. The inclusion of a water course and a Meccano bridge greatly enhances the appearance of a garden railway, but it must not be forgotten that rust is to be guarded against. Last month we advised readers who constructed garden layouts to take up their track in the evening. Similarly great care must be taken to prevent rails and Meccano parts from being splashed by the water of a stream that forms part of the miniature railway's surroundings. Little difficulty will be experienced in planning a bridge that may be taken up as easily as the track itself, however, and thus trouble from rain or dew may be avoided.

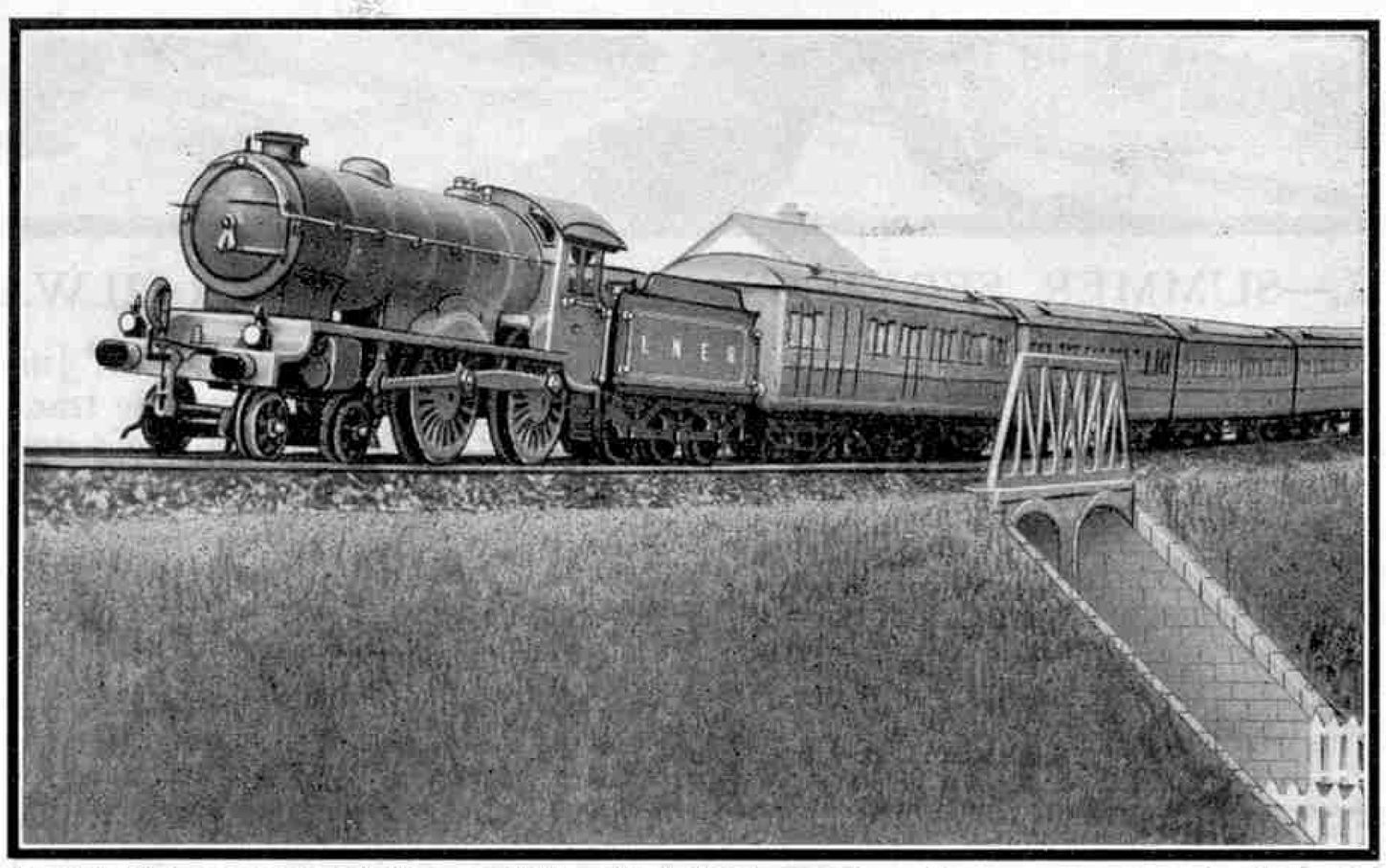
We have already referred to the construction of tunnels, but we may remind readers of the wonderful opportunities that a rock garden offers for interesting mountain railway engineering. Tunnels under the rock form an attractive feature and by the exercise of a little ingenuity several of these may be constructed in such a manner that trains emerge from one and almost immediately plunge into the blackness of a second.

Naturally before any effort is made to turn a rock garden into a representation of the mountain section of a railway full permission must be obtained. Usually this is granted freely, and in most instances the owner of the garden takes great interest in the scheme and offers really helpful suggestions towards its successful completion.

Operations on an outdoor layout are carried out in a similar manner to those on indoor tracks, but the runs between stations usually are longer and may be made

more interesting. Occasionally unexpected incidents occur that scarcely could happen on an indoor layout. For instance, one H.R.C. member reported that a worm decided to pass over a level crossing on his garden railway at the very moment when a local train hauled by a Hornby No. 1 Tank Locomotive was due! The worm moved slowly, and, as was to be expected, the misguided creature failed to clear the line in time and the train was derailed. Naturally the worm suffered greatly from the collision, but at the subsequent inquest the engine driver was completely exonerated.

One very interesting feature of a garden railway is that heavy gradients often are met with. These are not necessarily blemishes in an otherwise perfect line, for they may be made to add great interest to the working of trains. In order to enable operations to be carried out, they should not be so steep that even with a pilot or banking engine difficulty is experienced in hauling trains up them. Another reason why they should be kept within reasonable bounds is that otherwise the speed of a heavy descending train may become so great that disastrous derailments may occur. An accident on a miniature railway certainly produces great excitement and opportunities for realistic work, but to introduce one by making an incline too steep is not truly within the scope of the model railway engineer.



A splendid example of the realistic effect that may be obtained on Hornby layouts. A "Shire" locomotive hauling an express train on a lofty embankment, the road through it being spanned by means of the Viaduct.

Over a heavily graded section, working with the aid of a pilot engine is extremely realistic. A pleasing alternative is to attach a banking engine at the rear of a train that is to be helped up an incline. To do this is quite in accord with real practice. An interesting example of banking as carried out on real railways may be seen on the Lickey incline on the L.M.S.R. There a pair of 0–6–0 tank engines or the "Lickey Banker," an enormous locomotive with ten coupled wheels that was specially built at Derby for the purpose, are provided to help trains up the steep gradient of 1 in 37 that extends over a distance of two miles on the Bristol and Birmingham main line.

In reproducing this practice on a garden railway it is a good plan to place a wayside station at or near the foot of the gradient. There accommodation for the banking locomotive must be provided. For this purpose a single siding will be sufficient and the points giving entrance to this should be arranged in a trailing direction to the main line in order that the "banker" may easily be attached in the rear of the train.

In actual operation the first step is to bring the train to rest in the station and to rewind the motor in order to make sure that the maximum power will be available for the stiff climb. The banking engine is then brought from the siding. A few turns of the key only should be made in order to enable it to reach the rear of the standing train. A few trials will soon show how many turns are necessary. After coupling up, the motor of the banking engine should be fully wound and the brakes on the locomotives released. Care should be taken to release that on the leading engine first, for if this were not done the banking engine would give a violent push to the vehicles of the train before the leading engine is ready to move, and this probably would cause the couplings to become jammed.

Immediately the brake on the banking engine has been released the train commences to move and away it goes up the incline. It is very thrilling to watch the locomotives steadily mounting the slope, taking with them their heavy load, and those who construct a garden railway and operate it in the manner suggested will be well rewarded for their trouble.

Rocky country on the miniature electric railway of our reader, C. H. Bradnam, Bexhill-on-Sea. A Hornby Metropolitan locomotive hauling a goods train emerges from a long tunnel.

At the summit another stop must be made in order that the banking engine may be detached. This returns to its depot at the foot of the incline and there awaits the arrival of another train in need of a little friendly help.

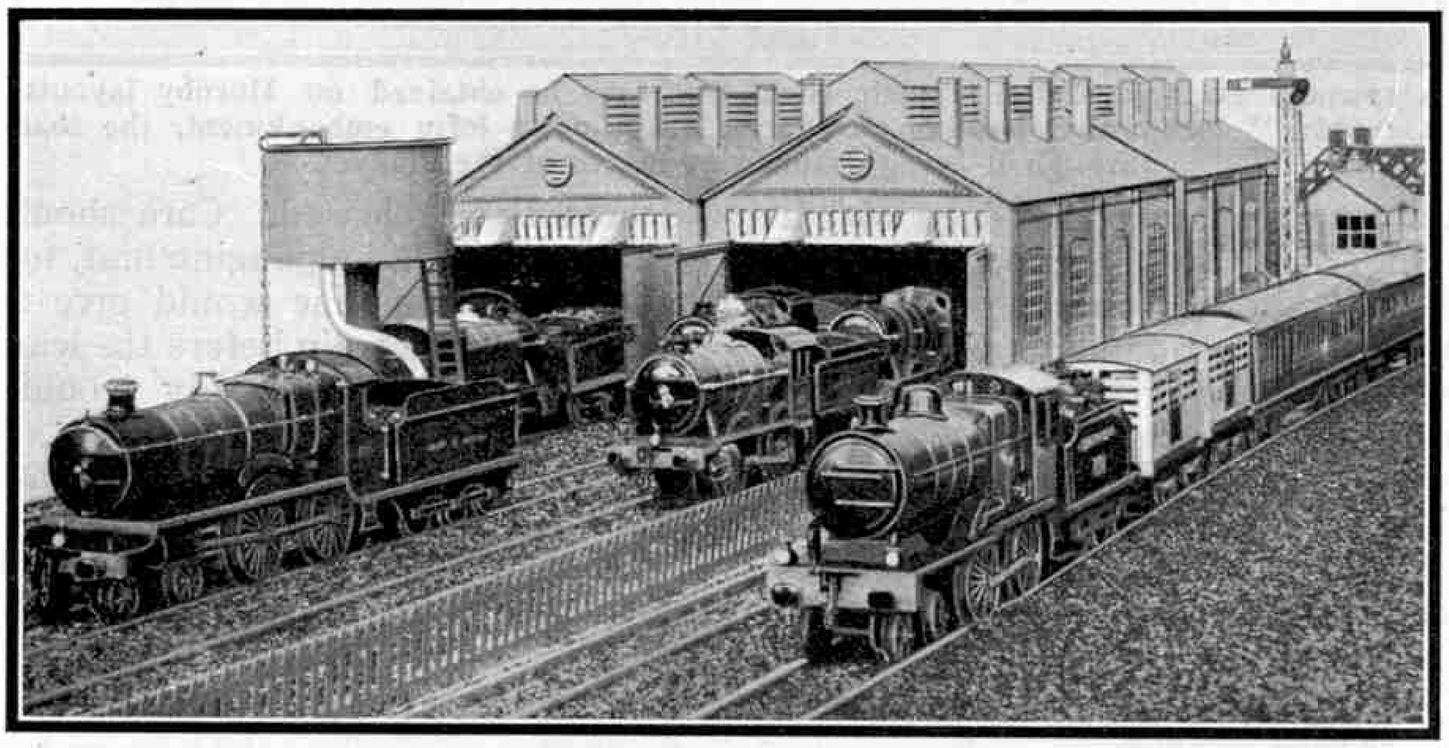
If the whole of the incline is on a straight length of track a very interesting plan of operations may be followed. As before, the banking engine may come up in the rear, but it need not be coupled to the train, for on the straight track no buffer-locking can occur. When the top of the incline is reached the trip on the

(Continued on page 646)

XXII.—SUMMER SERVICES ON MINIATURE RAILWAYS

AN interesting variation from ordinary track working on miniature railways is readily obtained by having what may be described as a special holiday season. During July the services on practically all railways are speeded up, and many additional trains are provided for the benefit of holiday makers. The time-tables are completely revised and a large number of special and excursion trains are included in the programme.

There are many features of this special traffic that may with advantage be included in a holiday season arranged on a miniature railway. One of these that is of particular value is the running of a large number of through trains, chiefly to holiday resorts, that pass over the lines of more than one company. Trains of this type are extremely convenient for passengers, who are saved the necessity of changing trains, and perhaps also of making a long wait at a transfer point. It leads to very interesting working, for one result is that the coaching stock, and even the locomotives, of one railway may be seen operating over the track of another and at quite a distance from their own country.



An example of inter-group working on a Hornby Railway. A train hauled by a Hornby Southern Railway No. 2 Special Locomotive passing an engine shed while running on a track representing a section of the Great Western Railway.

In real practice there are numerous through trains or through coach workings of this kind. A very good example is the "*Ports-to-Ports*" express, a train that runs between Newcastle on the L.N.E.R. and Cardiff on the G.W.R. Its run was fully described in the article in the "Famous Trains" series that appeared on page 524 of the "*M.M.*" for July, 1929. The train itself is composed alternately of G.W.R. and L.N.E.R. rolling stock. Banbury is the transfer point and between that station and Newcastle it is handled successively by locomotives of the G.C. and N.E. sections of the L.N.E.R., G.W.R. locomotives taking charge on the runs to and from Cardiff.

The "*Sunny South Express*" is another example of a train that runs over a "foreign" line. This runs over L.M.S. metals from stations north of London, the train being taken over at Willesden Junction by a S.R. locomotive that hauls it over the track of the West London Railway to Addison Road, and its journey to the holiday resorts on the South Coast is completed on the lines of the S.R. On this train L.M.S. stock is used, and the working arrangements on the return journey are similar in character.

Another interesting service is the one between Birkenhead and Bournemouth that is operated jointly by the G.W.R. and S.R. The transfer from one line to the other is made at Basingstoke. Since the stock of each company is used alternately, S.R. locomotives and coaches may often be seen running on G.W.R. metals, and of course the reverse arrangement also is familiar.

Many other instances of trains that travel over the lines of more than one company may be given and their representation in miniature should provide great fun and amusement, especially at the holiday seasons.

Special interest is created when the design and colour of the foreign locomotives differ greatly from those of the engines usually seen on the track. For instance, a miniature railway may represent a section of the G.W.R., and naturally the engines in use on it will have the domeless boilers, with safety valves mounted in the centre and the copper capped chimneys that are invariably seen on that company's locomotives. The addition to this stud of a S.R. locomotive immediately attracts notice.

How greatly the locomotives of these companies differ may be seen by a comparison of the representatives in the Hornby Series of the "County" class of the G.W.R. and the "L.1" class of the Southern Railway respectively. Almost the only point these have in common is the wheel arrangement, this being 4–4–0 in each case. The S.R. representative has a domed boiler, a plain chimney, a Ross-Pop safety valve, and a footplate and cab of quite distinctive shape. In addition, it is

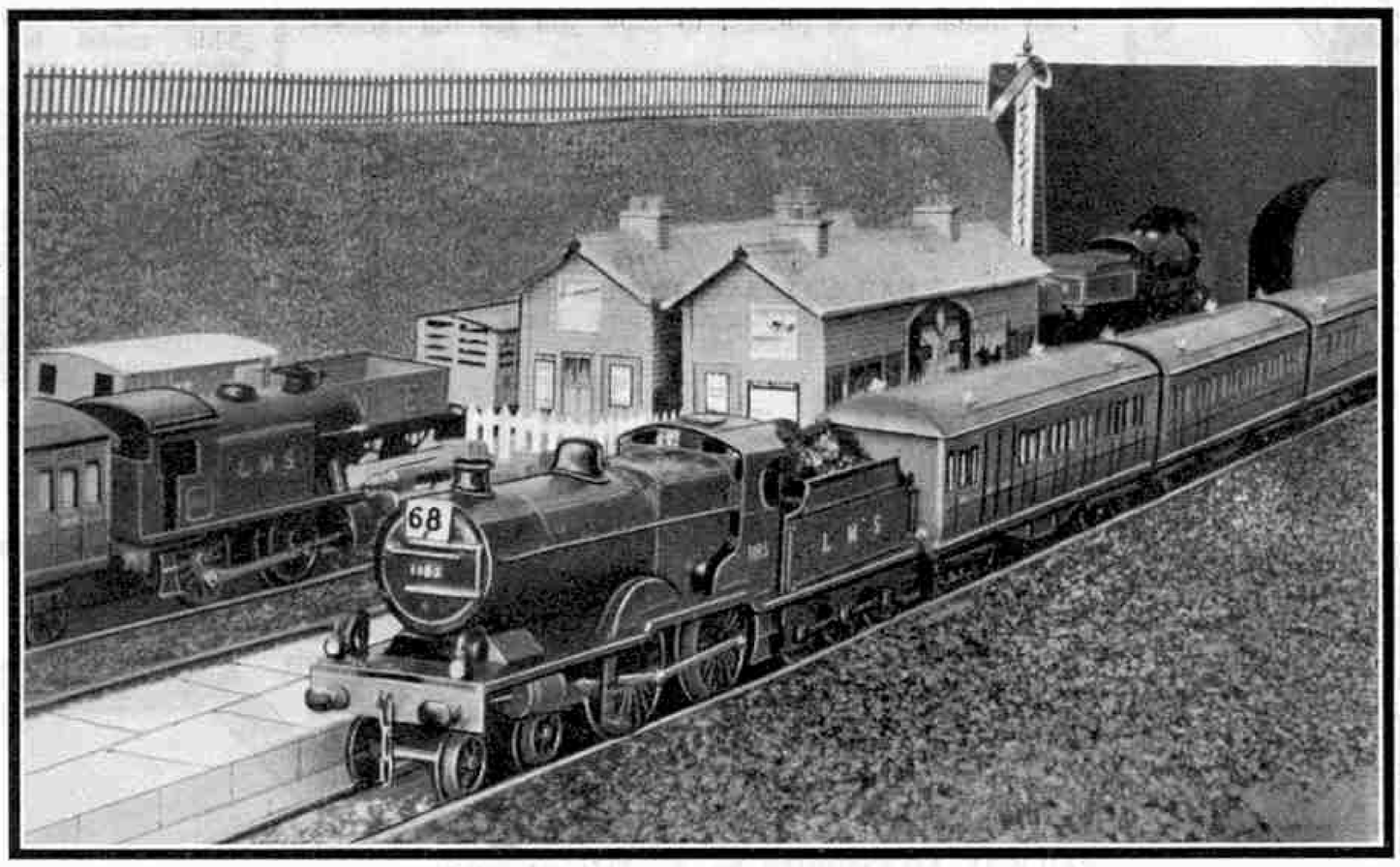
finished in a different shade of green from that of the G.W.R. locomotives, and has large numbers on the tender. The appearance of one of these among a number of Hornby No. 2 Special Locomotives of the G.W.R. "County" class, therefore, cannot fail to attract attention.

The introduction on miniature railways of trains that run on metals of different companies is of special value in planning operations on the layouts of local Branches of the H.R.C. The locomotives running on these tracks usually are the property of various members. They are almost sure to be a mixed collection, and in all probability each of the four railway groups is represented. On what often is supposed to be the track of a single railway company the employment of a number of locomotives of different types is not altogether satisfactory, but the difficulty may be got over by arranging through trains as already suggested.

In making use of this scheme on Branch layouts it is an excellent plan to take stock of the locomotives and coaches available and to suppose that the track reproduces the line of the company that is most strongly represented. It should then be quite easy to work out a timetable that includes local trains, composed of rolling stock of correct type, express trains that do not stray from their own tracks, and also through trains from the lines of other companies. The through trains may consist alternately of coaches of each of the two lines concerned, and may be drawn by the locomotives of each in turn. Naturally engines of the predominating line only are employed on local and express passenger trains that keep within the limits of the system.

If sufficient "foreign" locomotives and rolling stock are available, a bold policy may be pursued and developments in real practice may be anticipated by the introduction of trains between points on different systems that as yet are unconnected by a direct service. Planning these will be found an interesting pastime and little difficulty will be experienced in working out schemes that will suit the special requirements of any Branch that may desire to operate on these lines.

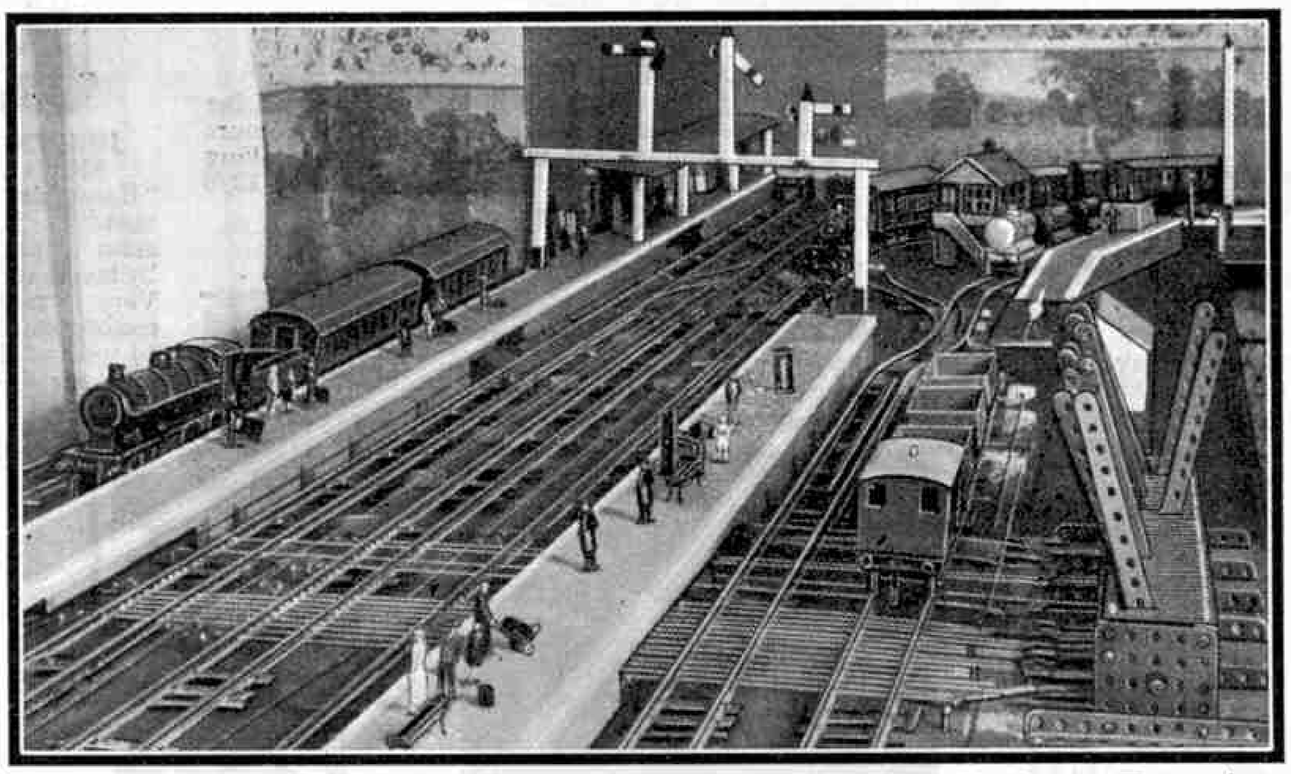
An interesting feature of holiday season traffic is the large number of special and excursion trains hauled by locomotives that display numbers in prominent positions. These numbers correspond to those in the working instructions issued to the staffs of the companies concerned, and enable employees to identify trains on their approach. It is not difficult to follow this practice on miniature railways. Headboards may easily be arranged either by writing a number on a piece of thin card, or by cutting the one required from a printed ticket or calendar. If necessary, a small piece of card should be gummed at the back in order to make the "board" thick enough to be attached firmly to the lamp bracket of a locomotive. As the upper illustration on this page shows, in this position a number board gives a most businesslike appearance to the engine on which it is displayed.



An excursion train hauled by a Hornby "Midland Compound" arriving at a station. A connecting branch line "motor-train" is waiting in the bay platform. The locomotive of this train pulls the coaches in one direction and pushes them when reversed.

Another notable feature of railway traffic during holiday times is the rush to the continent. Large numbers of tourists and other passengers travel to the coast by various routes on the Southern and L. & N.E. Railways, in order to embark on the steamers that are to carry them across the Channel or the North Sea. The L.M.S. also share in this traffic, vessels belonging to this company plying between Tilbury and Dunkirk.

The boat trains of these railways may be represented on a miniature system and in order to increase interest the steamship services connected with them also may be operated. In order to do this, it is necessary to provide a tank of suitable size and miniature steamers to ply on water contained in it. A great thrill may be obtained by arranging the arrival and departure of these in order to suit the railroad services to the ports.



An important station on the layout of our reader, J. Grime, Belfast. Extensive use is made of Meccano in the construction of lever frames used in the elaborate signalling arrangements.

An excellent example of combined rail and steamer services of this kind was described in the article by Captain Rodgers on page 542 of last month's *"M.M."* Those who wish to follow the author's example by introducing a Continental train service may easily do so with the aid of the miniature reproduction in the Hornby Series of the Riviera "Blue" Train.

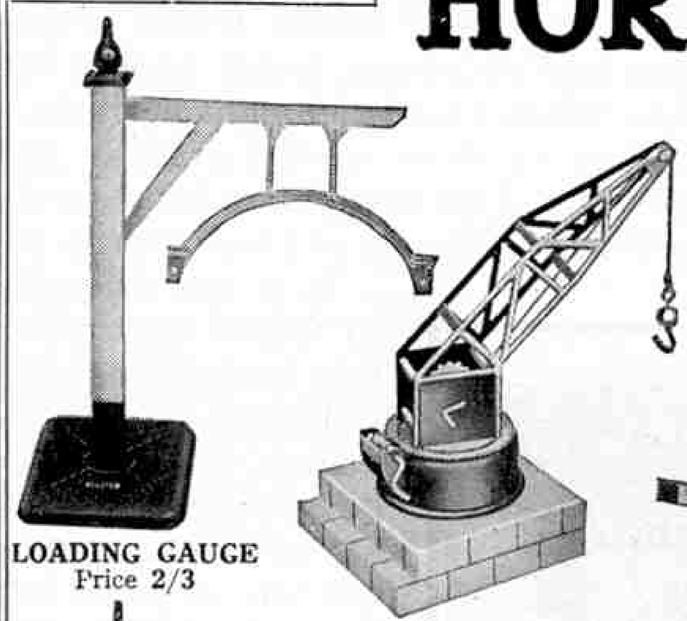
HORNBY SERIES

HORNBY ACCESSORIES

HORNBY SERIES

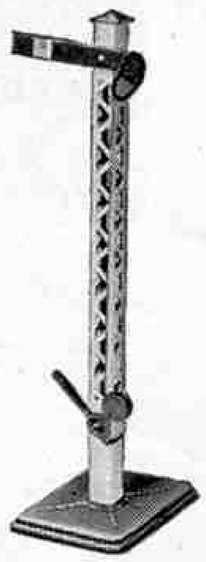
There is a splendid range of Railway Accessories in the Hornby Series, built in perfect proportion and beautifully finished. With these realistic Accessories the most elaborate model railway system may be constructed and operated in exactly the same manner as a real railway.

A selection of Hornby Accessories is illustrated below. Your dealer will be pleased to show you the full range.



LOADING GAUGE
Price 2/3

PLATFORM CRANE
This is a useful accessory. The Crane revolves on its base and is fitted with a crank and ratchet mechanism for controlling the load. Price 4/9



SIGNAL No. 1
Price 3/3 per pair. One "Home" and one "Distant."

RAILWAY ACCESSORIES No. 1
Miniature Luggage and Truck.
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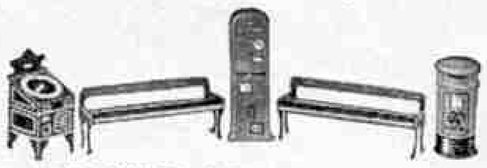

RAILWAY ACCESSORIES No. 3
Platform Machines, etc.
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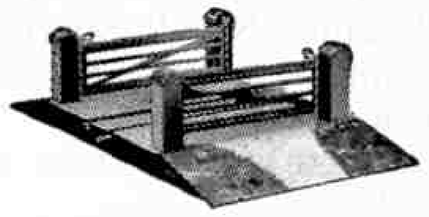
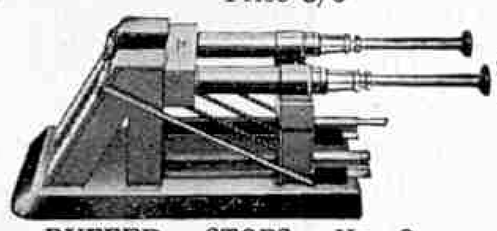
TELEGRAPH POLES
Price, per pair 4/-



LEVEL CROSSING No. 1
This model is realistic in appearance and beautifully enamelled in colours. It is suitable for a single track only and has gauge 0 rails in position.
Price 3/6



BUFFER STOPS No. 2 (HYDRAULIC)
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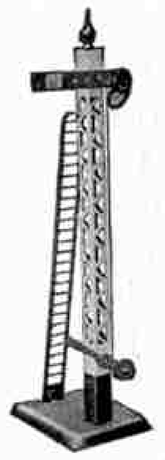
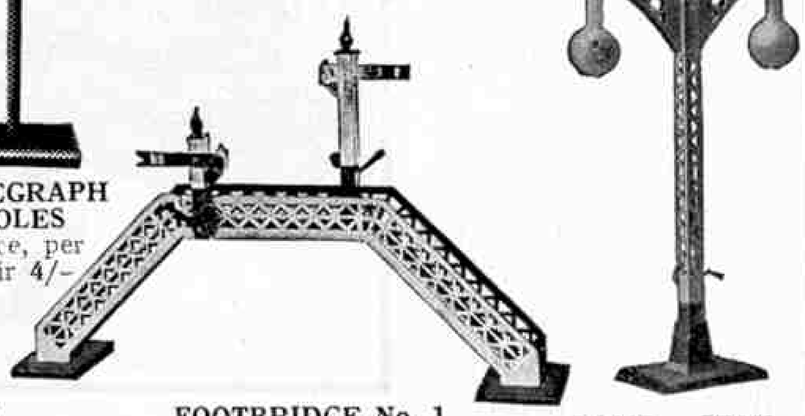


SIGNAL No. 2
Price 2/6 each. "Home" or "Distant."



FOOTBRIDGE No. 1
(Without signals) ... Price 4/-
FOOTBRIDGE No. 2
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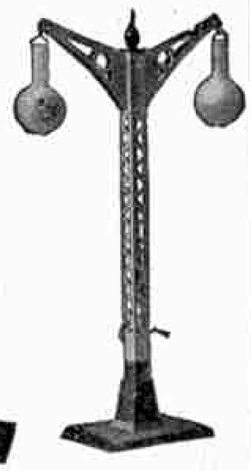
Signals only, per pair 3/9



LAMP STANDARD No. 2 (DOUBLE)
Electric flash-lamp bulbs may be fitted into the globes.
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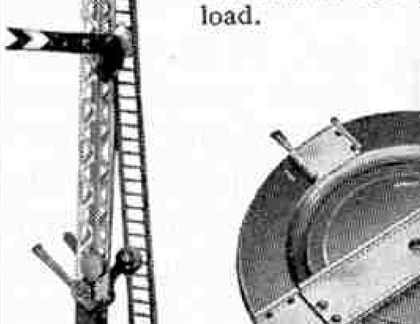

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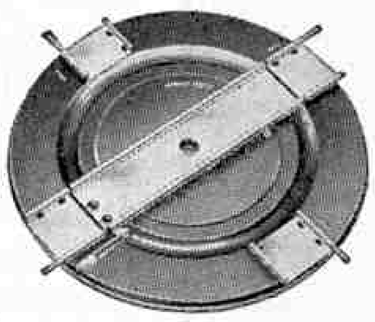
Price 4/3 per pair.



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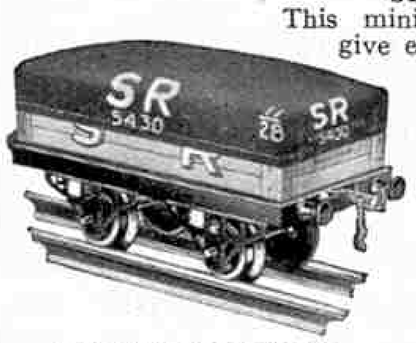
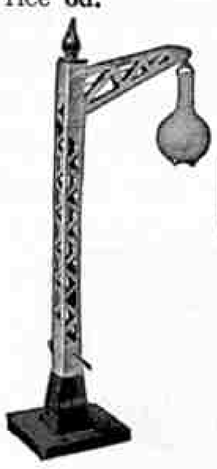
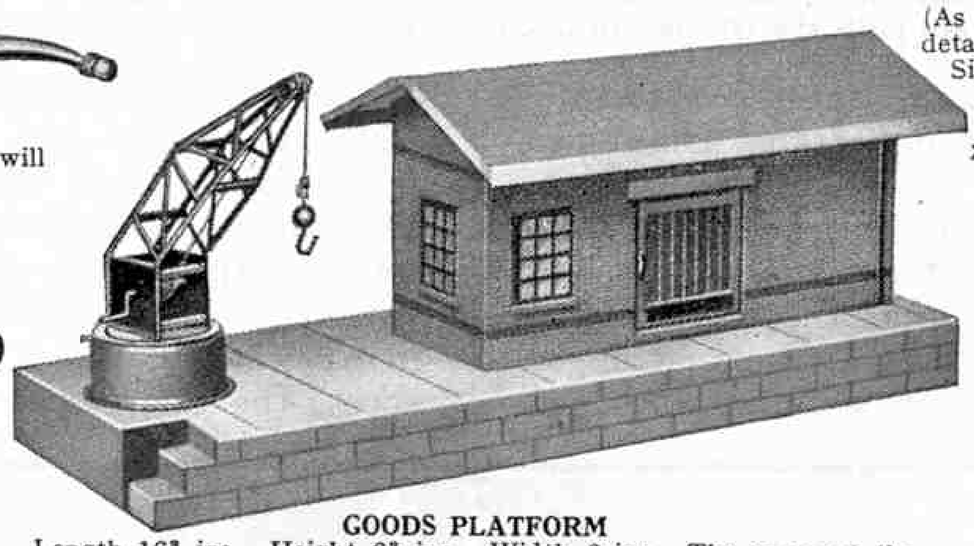
(As illustrated.)
Price 3/- each.



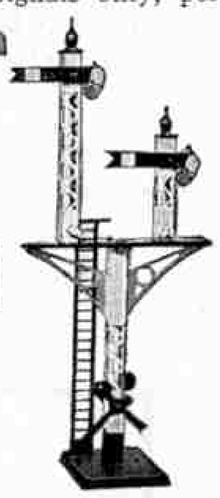
TARPAULIN SHEETS
Strongly made. Lettered L.M.S., N.E., G.W. or S.R. The above illustration shows one of the Tarpaulin Sheets fitted to a Hornby Wagon.
Price 3d.



OIL CAN No. 1
This miniature Oil Can will give every satisfaction.
Price 6d.

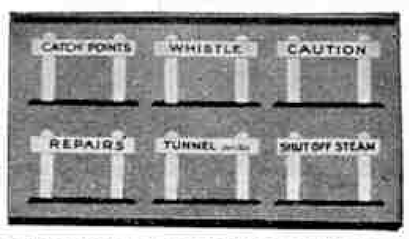


GOODS PLATFORM
Length 16¾ ins. Height 6¾ ins. Width 6 ins. The crane at the end of the platform revolves on its base. It is enamelled in colours and is fitted with a crank and ratchet mechanism for controlling the load ... ... Price 12/6

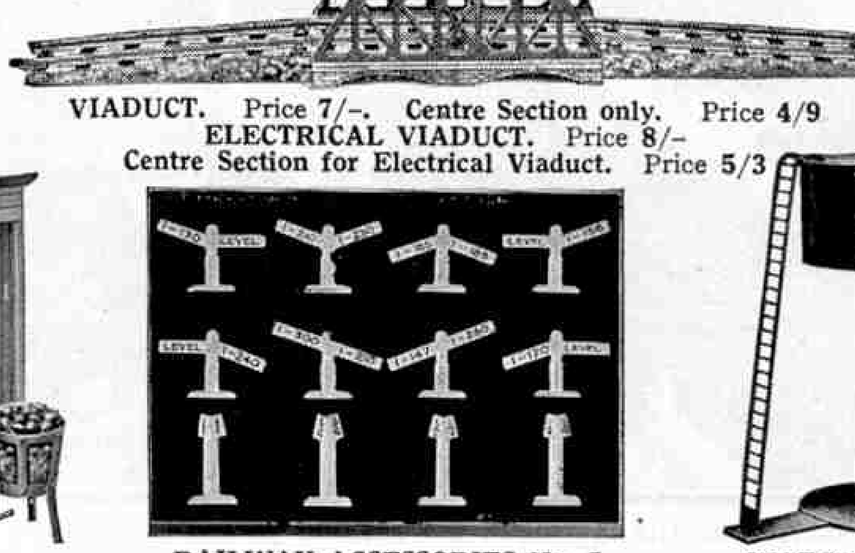


JUNCTION SIGNAL
"Home" or "Distant." Signal arms operated by levers at base. Very realistic model, standing 14 ins. in height.
Price 6/-

SIGNAL CABIN No. 1
Dimensions: Height 6 ins. Width 4½ ins. Length 6 ins. Finished in colours ... Price 2/9



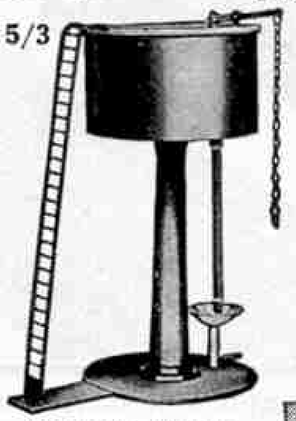
RAILWAY ACCESSORIES No. 8
Notice Boards.
Price, per set 2/3



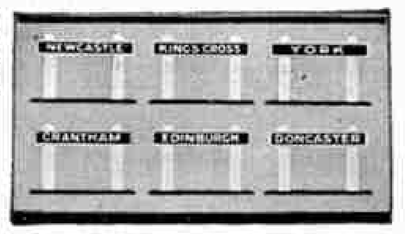
LAMP STANDARD No. 1 (SINGLE)
An electric flash-lamp bulb may be fitted into the globe. Price 3/6

VIADUCT. Price 7/-. **Centre Section only.** Price 4/9
ELECTRICAL VIADUCT. Price 8/-
Centre Section for Electrical Viaduct. Price 5/3

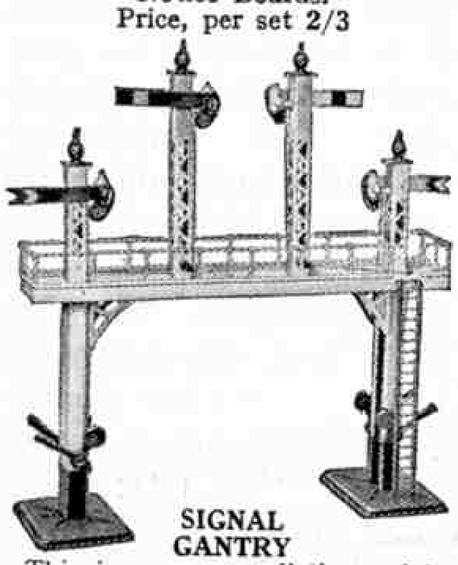
RAILWAY ACCESSORIES No. 5
Gradient Posts and Mile Posts. Price 2/-



WATER TANK
Brightly coloured. Fitted with flexible tube and valve lever.
Price 8/6



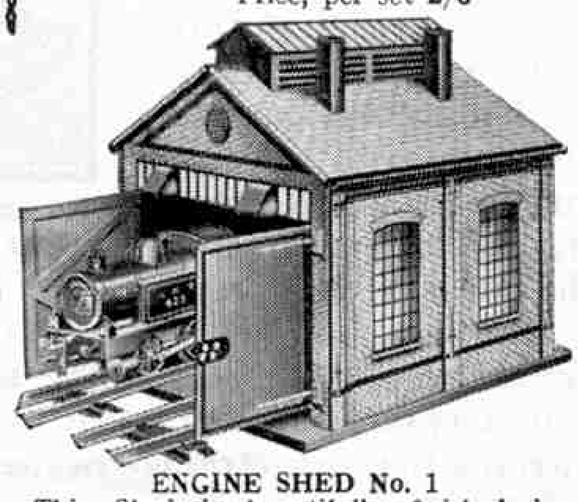
RAILWAY ACCESSORIES No. 9
Station Name Boards.
Price, per set 2/6



SIGNAL GANTRY
This is a very realistic model, the signal arms of which are operated by levers at the base of the standards. Attractively finished in colours. Price 10/-

RAILWAY ACCESSORIES No. 7
Watchman's Hut, Brazier, Shovel and Poker ... Price 1/6

RAILWAY STATION No. 2. Excellent model, beautifully designed and finished. Constructed in three sections, which are detachable. Dimensions: Length 2 ft. 9 ins., breadth 6 ins., height 7 ins. ... ... Price 12/6



ENGINE SHED No. 1
This Shed is beautifully finished in realistic colours. It will accommodate Locomotives and Tenders of the M series, and Locomotives of No. 0 and No. 1 types ... ... Price 15/-

The Hornby Locomotive Sheds

By "Tommy Dodd"

A LINESIDE accessory that on real railways plays a very important part is the engine shed. Its obvious purpose is to house locomotives when they are not on duty, but in actual practice it is the scene of much active and interesting work. The driver of the engine has by no means finished with his charge when the shed is reached, for before he can leave he must hand in his report and see that his engine is in good order or that defects are notified.

When an engine arrives at the shed it is examined very thoroughly, usually being driven over a pit in order that brake gear, bearing springs and inside valve gear may easily be seen. Any defects are recorded on a repair card and before the driver "books off" duty he hands this in together with his job-card.

The fireman's duties also do not end when the locomotive returns to its sheds. Immediately on arrival he removes the ashes that during the run have accumulated in the smoke-box and also cleans out the fire-box and ashpan. The shed staff then take charge of the engine. They fill the water tanks and replenish the supply of coal in the tender or bunker. These tasks are accomplished outside the shed, of course, and when they have been satisfactorily completed the engine returns thither.

In addition to the routine work that is carried out after every spell of duty a locomotive is given a more thorough overhaul at intervals, this work being carried out by the engine shed staff. For instance the boiler of an engine periodically is thoroughly washed out. The length of time allowed to lapse between successive operations of this kind depends on the character of the feed water, scale forming more quickly, and periodical cleanings being carried out more often, when hard water is used.

The first step in this operation is to blow off steam and allow the boiler to cool down slowly. The water is emptied out and various plugs are removed to enable a stream of water to be directed on the interior surfaces. In order to dislodge the scale that forms in awkward corners flexible metal rods are employed. As a rule, hot water is used for washing out boilers in this manner. For the purpose, this is obviously superior to cold water, for not only is time saved when steam again has to be raised, but in addition, expansion and contraction due to large variations in temperature are avoided. This is an important point, for such changes may result in a boiler becoming leaky. It is interesting to note, by the way, that when raising steam from cold, the fire is started about three hours before the engine is due to depart on duty.

Several types of locomotive sheds are in use, the more important being the "round-house" and the "straight through" types. The name of the former is sufficiently descriptive of its shape. In its centre is a turntable from which lines radiate, thus making it possible for locomotives to enter or leave the shed without disturbance. Another advantage of the round-house type is that it is not necessary to pay so much attention to the marshalling of locomotives, for one that is required for service may be taken almost straight from the shed at any moment.

A wonderfully realistic representation of a locomotive depot made by placing four Hornby Locomotive Sheds side by side.

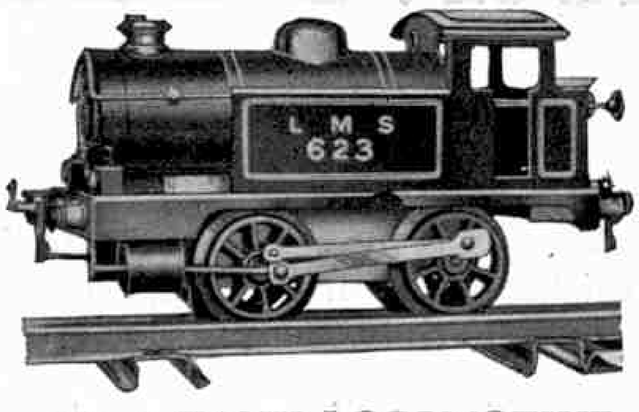
To most readers the straight-through locomotive shed is probably the more familiar type. The tracks in this run through the shed and doors are provided at each end. They extend beyond the limits of the building itself and a turntable is employed to connect the roads as well as to enable the locomotives to be turned round. Often the turntable is placed on a small dead-end siding in order that locomotives entering or leaving the shed need not be taken over it.

The Hornby Locomotive Sheds are of the "straight-through" type, of which they are splendid representations. In both the No. 1 and the No. 2 sheds, two tracks are provided in order to give ample accommodation for Hornby Locomotives. They are finished in a very realistic manner to represent brickwork with a slate-covered roof, the latter being provided with gutters. They are well ventilated—a very important feature of a well-planned locomotive shed—adequate chimneys on the roof being provided to lead off smoke and steam, and double doors are fitted at each end.

A suitable position for a Hornby Locomotive Shed is near a terminal station or, if one of these is not provided on the layout, close to the principal through station. The tracks leading to and from the shed may be extended to any convenient distance by means of standard rails and should be connected to a single track by means of a standard parallel point. A turntable included in the layout of a locomotive depot should be placed on the single track section next to the point. If this is done engines may be turned round, as necessary, as soon as they enter the locomotive yard, and then may proceed to their tracks in the shed

(*Continued on page 646*)

HORNBY TANK LOCOS



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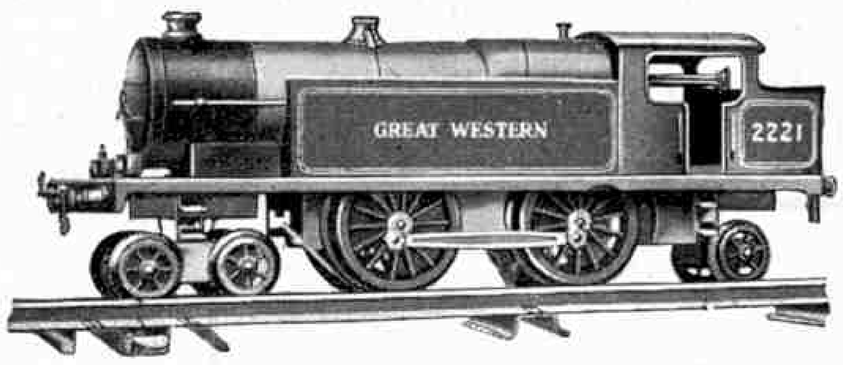

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TEAM PRIZE in the Senior

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Running a Garden Railway—

(*Continued from page 641*)

engine in the rear of the train may be operated by means of a reverse rail. This locomotive will then appear to detach itself, and automatically will return down the slope.

In carrying out operations on this plan alertness is necessary, for the reverse rail must be set after the engine at the head of the train has gone past. Most Junior members will be quite capable of doing this, however, and after a little practice will become quite expert.

A very interesting time may be spent by carrying out on an outdoor layout operations similar to those performed on real railways by the staff of the Permanent Way Department. For example, ballasting of the track may be carried out in the orthodox manner by running a special train along the line, from the wagons of which the ballast may be tipped. The Hornby Tipping Wagon will be found useful on such a train. From it the ballast may be tipped in convenient positions at the side of the line and later it may be shovelled between the sleepers in the regulation manner.

The tipping of material to form embankments and similar work required in the extension of a railway also may be carried out, trains conveying the necessary materials passing over the portions of the line already constructed. To many miniature railway enthusiasts, constructional work of this kind may prove more attractive than actual train operation. It will certainly enable them to realise how much work is required in order to build a real railway track of the high standard necessary.

The Hornby Locomotive Sheds—

(*Continued from page 645*)

On a large layout the number of locomotives in use may be so great that the Hornby Engine Sheds are not big enough to provide the necessary accommodation. It is quite a simple matter to overcome this difficulty by placing two engine sheds side by side provided there is sufficient space available. The appearance of a shed thus formed is very impressive.

Very little difficulty also will be experienced in planning a layout for a yard that will enable full use to be made of the four tracks thus provided, and by the introduction of suitably placed water towers and possibly, also, of a representation of a coaling plant, a very realistic miniature reproduction may be made of a full-sized locomotive yard.

Care should be exercised in the design of the yard in order that idle locomotives may be run on tracks where they are out of the way of those proceeding in or out of the shed. In addition, if a coaling stage is provided, accommodation for wagons of locomotive coal also must be provided. Periodically a number of wagons should be worked into the yard in order to take away the ashes that accumulate from the fire dropping or fire-box cleaning. A locomotive engaged on this duty may be seen on the right-hand side of the illustration on page 645.

The reproduction of a locomotive yard and the use of Hornby Engine Sheds in this manner will add greatly to the enjoyment of running a Hornby Railway and enthusiasts also will have the satisfaction of knowing that their locomotives are stabled clear of the line and protected from dirt and dust.

RESULT OF CRICKET BAT COMPETITION

When a unique prize is offered for competition one naturally looks for a keen tussle for the honour of securing the award, and this was the case in our Cricket Bat Contest, announced in the "*M.M.*" for December last. This competition had as its premier award a bat specially autographed by the members of the South African Cricket Team that toured England last year, and also by the members of the Lancashire County XI, and by Mr. Frank Hornby, inventor of Meccano and Managing Director of Meccano Limited.

As announced in June, the chief award went to S. J. Tucker of Woking, and the full list of prizewinners is as follows:—1. S. J. Tucker (Woking); 2. H. S. North (Boundstone), near Farnham, Surrey; 3. M. S. McAlpine (Liverpool).

Consolation Prizes:—Pocket Wallets—W. Brayshaw Yeadon (Yeadon, Nr. Leeds); D. B. Caulkin (Birmingham); P. T. Cooper (Leeds); G. V. Dunster (London, S.E.15); J. W. Edwards (Streatham, S.W.16); C. Mertens (Berwick Station, Sussex); A. E. Pratt (Jersey, C.I.); D. Scholey (Morpeth); J. L. Stevenson (Inverness). Books—R. Beardsell (Huddersfield); K. Kidd (London, S.W.18); C. Lemon (Croydon); J. A. McCallum (Glasgow, W.2); G. Matthews (Lyttelton, N.Z.); R. V. Moss (Wellington, N.Z.); R. F. E. Paterson (South Kensington, S.W.5); P. D. Saner (Cottingham); J. W. Sear (South Norwood, S.E.25); P. Senst (Purley); R. E. Yeend (Cheltenham).

Many competitors may wish to check their entries, and to those who make application a copy of the answers to the fourteen questions will be sent in order to enable them to do so.

H.R.C. COMPETITION PAGE

An Interesting Voting Contest

Competitions appearing on this page are open only to members of the Hornby Railway Company. Envelopes containing entries should have the title of the competition clearly written in the top left hand corner and should be addressed to the Hornby Railway Company, Binns Road, Old Swan, Liverpool. The name, address and membership number of each competitor should appear in clear writing on every sheet of paper used.

WHETHER it is required for the layout of a local Branch or for the track of an ordinary member of the H.R.C., the acquisition of a new miniature locomotive is a very important event. In all cases much anxious care and consideration will be given to the task of selecting one that will be most suitable for the intended purpose.

In a Branch the choice of a new engine naturally falls to the Locomotive Superintendent, but it is quite certain that he will receive good advice from practically every member, each of whom will be anxious to further the claims of the particular locomotive that makes the strongest appeal to him! To a certain extent this depends on the one of the four railway groups that is specially favoured. For instance, a partisan of the L.N.E.R. will uphold the merits of the Hornby No. 3 "*Flying Scotsman*," or perhaps those of the L.N.E.R. "*Yorkshire*," the representative in the Hornby system of the well-known "Shire" class of that line. A G.W.R. enthusiast may prefer the "County" class to all others, and those who are specially attracted to other groups naturally will recommend the choice of a representative of the locomotives to be seen on their lines.

This brings us to the question of the relative popularity of the various locomotives of the Hornby series among miniature railway enthusiasts. For our competition this month therefore, we ask members to place in their order of preference the nine locomotives in the list that appears in the centre of this page. These include clockwork and electric locomotives, tanks and tender engines, and as all possess specially attractive features the task of determining their order of popularity is not a light one.

No doubt many competitors will take appearance into account, and as this is the holiday season, a large number will have splendid opportunities of comparing the majority of the locomotives named with their prototypes. But other qualities should not be forgotten. Each entrant should forget his own leanings toward the locomotives of his favourite line, and should carefully and impartially study the nine locomotives whose names are given in the panel.

After thinking over the problem, each competitor should first indicate which locomotive would be his own choice, and then make out a neatly written list of the nine in what he thinks is the order of popularity. His entry must then be forwarded to H.R.C. Headquarters, Binns Road, Old Swan, Liverpool, in an envelope marked "Locomotive Voting Contest."

Metropolitan Electric Locomotive L.V.
No. 1. Special Locomotive and Tender
No. 2. Special L.M.S. Midland Compound, No. 1185
No. 3. S.R. "*Lord Nelson*"
No. 2. Special G.W.R. "*County of Bedford*".
No. 2. Special Tank Locomotive
No. 3. L.N.E.R. "*Flying Scotsman*"
No. 1. Electric Tank Locomotive
No. 2. Special L.N.E.R. "*Yorkshire*"

The competition will be judged by popular vote and the prizes will be awarded to the competitors whose lists most nearly agree with that based on the first choices of the entrants. A number of consolation prizes also will be given, and in the event of a tie neatness and originality in presentation will be taken into account in making a decision.

The competition will be divided into the usual two sections—Home and Overseas. In each four prizes will be awarded. These will consist of Hornby Train goods (or Meccano products, if preferred) to the value of 21/–, 15/–, 10/6 and 5/– respectively. Entries in the Home section must be posted to reach Headquarters on or before the 30th August, and the closing date for Overseas competitors is 29th November. Competitors are again reminded that entries not bearing their H.R.C. number will be disqualified.

Railway Photographic Contest

August is the chief holiday month of the year. In it the light usually is good, and most members usually have splendid opportunities of taking photographs of railway subjects. For our second competition, therefore, we invite them to submit prints of this kind. These will be judged on their merits as railway photographs, and technical excellence will only be taken into account in cases where entries are otherwise equal. Prints only should be sent, and each must bear on the back the name and H.R.C. number of the competitor.

The contest is divided into the usual two sections—Home and Overseas—and Hornby Railway material (or Meccano products if preferred) to the value of 15/–, 10/6, 5/– and 2/6, will be awarded to senders of the best photographs submitted in each of these. Envelopes containing them should be clearly marked "Railway Photographic Contest" and posted to reach H.R.C. Headquarters on or before 30th August. Overseas closing date, 29th November.

H.R.C. Competition Results

HOME

April "Grooming A Giant Locomotive" Essay.—First: H. L. Farr (10786), Bideford. Second: J. T. Trotter (11447), London. Third: D. G. Brock (3451), London. Fourth: L. Grugeon (4023), Chiseldon. Consolation Prizes: W. Binns (3347), Blackpool; R. Hawthorn (8310), Coventry; E. R. Routley (3327), Brighton; J. Deamer (14971), London; W. A. Chesterton (12805), Wolverhampton; J. E. Everitt (542), London.

May Mystery Locomotive Contest.—First: F. Byron (1347), Nottingham. Second: D. W. Pennick (4610), Red Hill, Surrey. Third: G. Hughes (7036), London. Fourth: A. Baker (11390), Birmingham. Consolation Prizes: L. O. Baker (6752), London; S. Winnard (7843), Wigan; W. Oliver (8526), Glossop; A. Glover (142), Newcastle.

May Train Drawing Contest.—First: R. Smith (14750), Ossett. Second: L. T. Levitt (7965), Swansea. Third: G. A. Nix (2993), Mickleover. Fourth: W. N. J. Pitt (15170), Newton Abbott. Consolation Prizes: A. Aston (2186), Sheffield; R. Knowles (7309), Bognor Regis.

June Track Planning Contest.—First: R. W. Blake (345), Twickenham. Second: A. Sandison (6558), S. Croydon. Third: F. Hodson (9430), Bolton, Fourth: R. Hall (15976), Sanderstead. Consolation Prizes: J. M. Johnston (5484), Dunstable; A. S. Lucking (3556), Witham; R. M. Tuke (9898), Banbury; W. Binns (3347), Blackpool.

June Train Photo Contest.—First: F. H. Braithwaite (14869), Guildford. Second: G. M. Lane (11170), Wakefield. Third: J. W. Hague (1258), Ripon. Fourth: N. H. Chivers (797), London. Consolation Prizes: D. Whitehouse (221), York; G. Y. Tomlinson (10196), Blackpool; H. Willatt (10311), Monkseaton.

OVERSEAS

March Second Locomotive Name and Number Contest.—First: H. D. Webber (8853), Johannesburg, S. Africa. Second: F. D. Aria (12362), Bombay, India. Third: F. E. Mills (9375), Nilgiri Hills, S. India.

March Safety First on Hornby Layouts Contest.—First: J. H. Rodriguez (3647), Montreal, Canada. Second: J. F. Dennison (9332), Stirling, Otago, New Zealand. Third: W. Fagg (8557), Milton, Otago, New Zealand.

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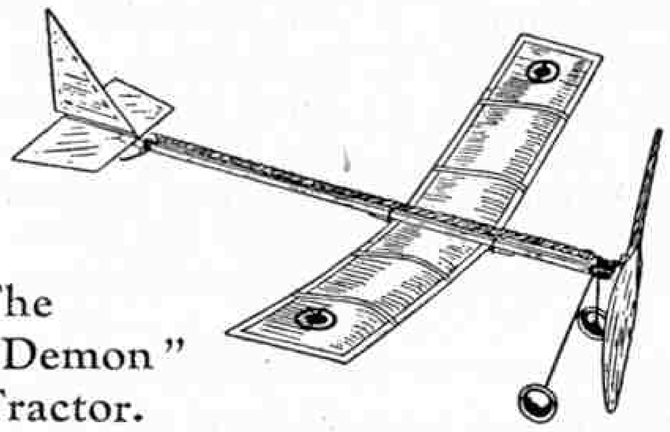

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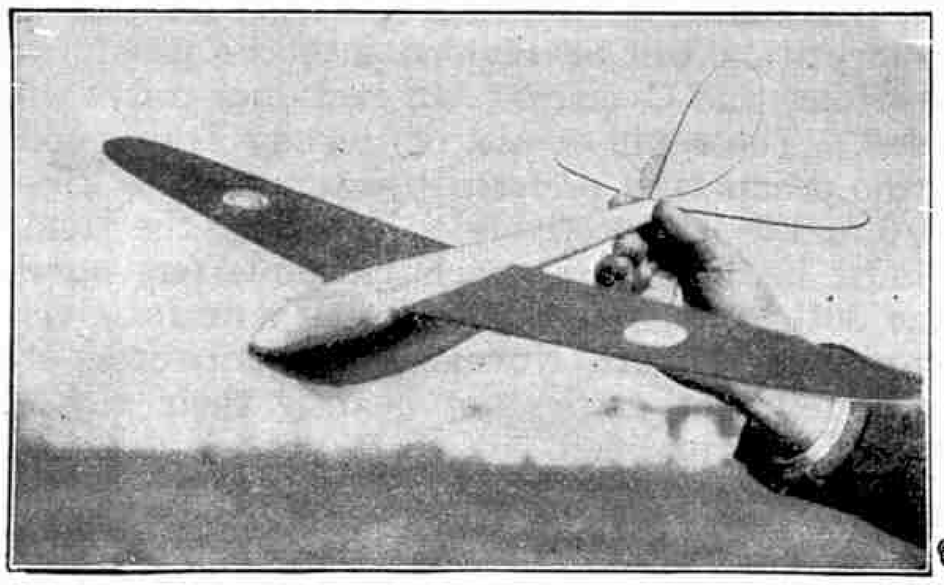

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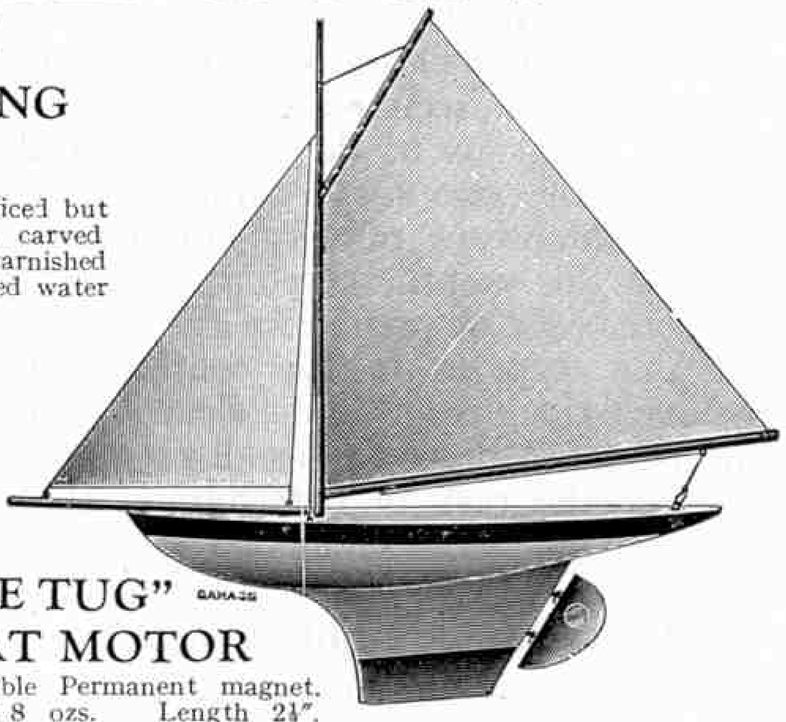

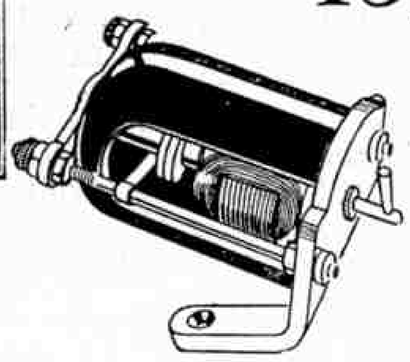

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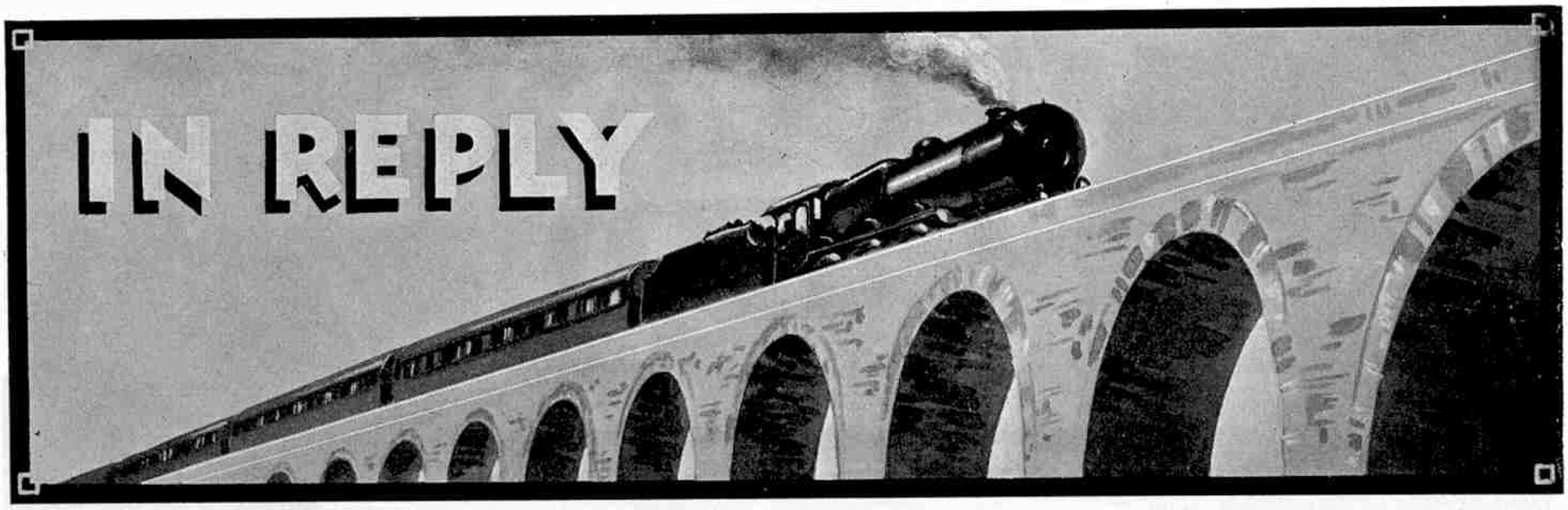


Suggested Hornby Train Improvements

INTERLOCKING LEVER-FRAME.—We are afraid that the comparatively high cost of an interlocking lever frame would prevent it from becoming really popular. One may be constructed from Meccano parts, as described on page 65 of the "*M.M.*" for January 1929. (*Reply to T. Burton, Southampton; F. Wainwright, Yeovil, and others*).

WAGONS MADE OF WOOD.—Your suggestion that we should replace our present range of wagons by vehicles of wood is interesting, but scarcely practicable. We think that the materials at present employed give a realistic result, and in actual practice the use of metal is becoming more common. (*Reply to J. Bompas-Smith West Didsbury, Manchester*).

THREE-LINK COUPLINGS.—The cost of fitting three-link couplings, and the special buffers that would be necessary in order to prevent buffer-locking on curves, would necessitate a rise in price of the vehicles so fitted. A conversion set to enable owners to fit up their stock if desired with these couplings probably would meet your wishes, and this will be considered. (*Reply to I. T. G. Johnstone, Wellington, N.Z.*).

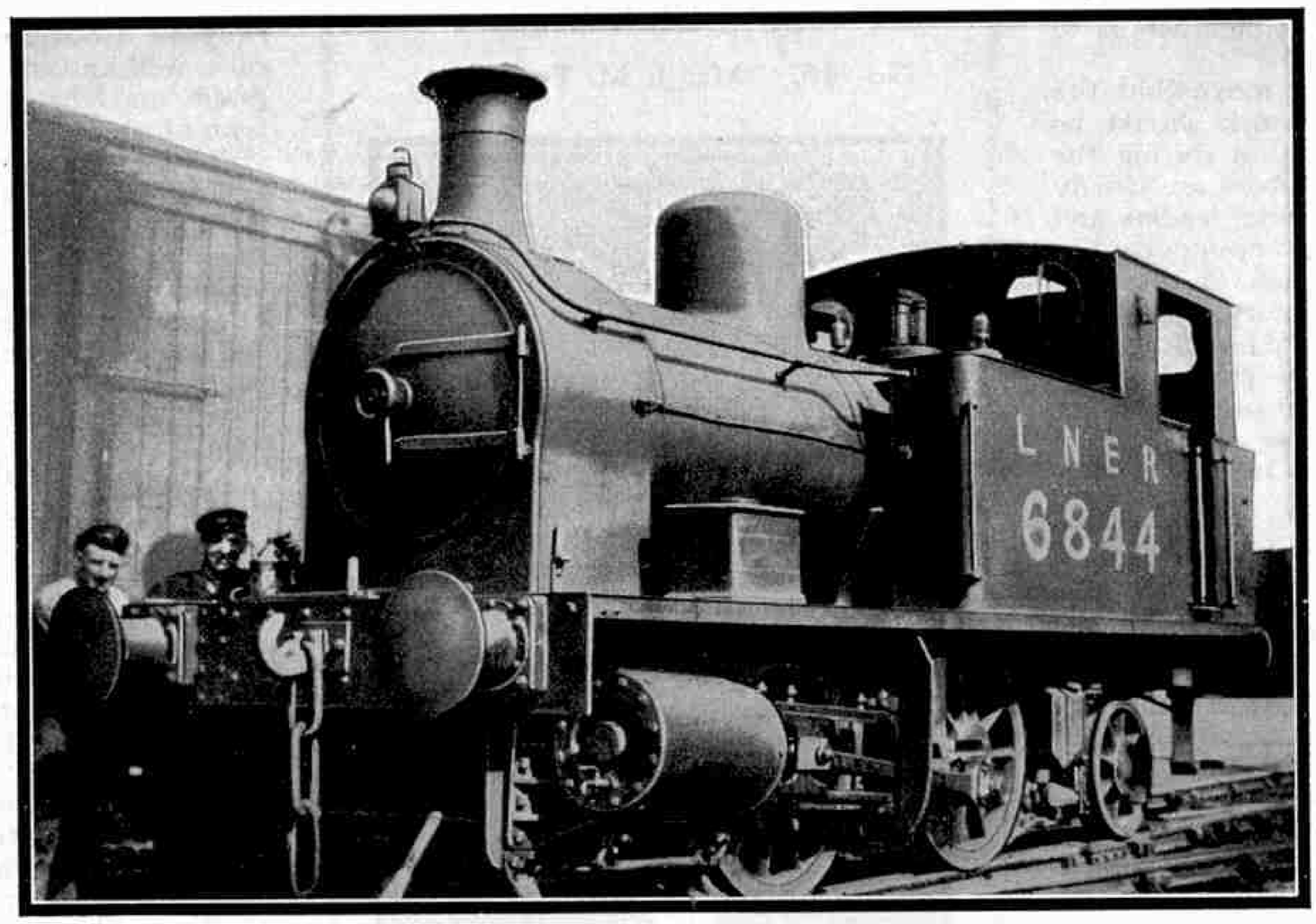
TINS OF PAINT FOR RE-ENAMELLING HORNBY TRAINS.—We are interested in your suggestion that small tins of paint of the colours used for Hornby Trains should be made available, in order to enable owners to touch up their locomotives and rolling stock when these become chipped. We are filing the idea, and if it is adopted particulars will appear in the "*M.M.*" (*Reply to F. B. Graves, Catford*).

COALING STAGE FOR LOCOMOTIVE YARDS.—We agree that a coaling stage with chutes for delivering coal to the tenders of locomotives would be an attractive accessory. The disadvantage of your proposal to equip one with a water tank and accommodation for wagons is the high cost of production, and at present the scheme does not appear practicable. (*Reply to S. V. Walker, Birmingham*).

LONGER PULLMAN COACHES.—We do not see that any advantage would be gained by increasing the length of Hornby Pullman Coaches. If your suggestion were adopted these would be too long for the curves of the Hornby Track, and trouble would be experienced owing to buffers and couplings interlocking. In addition there would be a tendency for vestibule connections to cause derailment. (*Reply to J. Dutton, Sevenoaks*).

INTERNAL FITTINGS FOR COACHES.—The realism of coaches is increased by furnishing them internally, but we are of the opinion that this is not a very important matter, for on miniature railways the interiors of coaches are seldom seen. The increased cost of finishing coaches in this manner would be appreciable, and for the present we suggest that you should fit up your own stock in accordance with your own ideas. (*Reply to T. Brown Wigan*).

CLOSE-COUPLED SUBURBAN SET TRAINS.—We think that there is only a limited demand for trains composed of four-wheeled coaches permanently coupled up in "sets." Although at one time in very common use, these are now being replaced by more up-to-date trains of bogie vehicles, and representations of these may be included in the Hornby Series when a convenient opportunity occurs. (*Reply to S. Wainwright, Enfield*).



L.N.E.R. outside cylinder 0-4-2 Tank Locomotive photographed at Aberdeen by our reader, C. M. Furst of Joppa, Midlothian. This shunting engine formerly belonged to the Great North of Scotland Railway, now incorporated in the L.N.E.R. Its buffers have unusually large heads in order to prevent interlocking on sharp curves.

ENAMELLED SLEEPERS FOR DOUBLE TRACK.—The sleepers of Hornby Double Track would be improved in appearance if they were enamelled instead of being given a nickel finish, and your suggestion will be given careful consideration. If it is decided to make a change an announcement will appear in the "*M.M.*" (*Reply to T. Davidson, Newcastle*).

IMPROVED TELEGRAPH POLES.—Telegraph wire supports with two main posts and a large number of insulators are often seen on real railways, but reproductions of these would be too costly to find favour with many enthusiasts. We think most miniature railway owners find that the present Hornby Telegraph Poles satisfy their requirements. (*Reply to J. Bookman, Letchworth*).

"SWAN-NECK" STATION LAMPS.—We are aware that lamps of this type are often used on station platforms. Their introduction into the Hornby Series probably would be popular, and we shall keep the idea before us when re-designing our lamps. (*Reply to T. Ellis, Shenforth, Monmouth*).

PARCEL VANS.—We agree that miniature parcel vans of this kind would be attractive and realistic additions to the Hornby Series. Their introduction at a later date will be considered. (*Reply to F. S. Satterthwaite, Kendal*).

DISC WHEELS FOR HORNBY ROLLING STOCK.—We are aware that in real practice rolled steel disc wheels are being adopted on rolling stock, but we are of the opinion that no immediate advantage would be gained by the introduction of similar wheels on rolling stock of the Hornby Series. We suggest that you use the existing Mansell or spoked wheels as desired. Your suggestion is novel, however, and we will keep it before us for consideration. (*Reply to A. J. Parry, York*)

WAGONS LETTERED "H.R.C."—Wagons lettered in this manner undoubtedly would be popular with members of the Hornby Railway Company and would be specially suitable for Branch work. We shall consider the idea when our rolling stock is next revised. (*Reply to T. McLean, Blackburn*).

ADDITIONAL GRADIENT POSTS.—An extension of our range of Gradient Posts to give a wider choice of figures would appeal to many Hornby Train owners. We shall bear the idea in mind. (*Reply to D. G. McKinnon, Glasgow*).

PLATELAYER'S TROLLEY.—We scarcely think that at present a miniature reproduction of a platelayer's trolley would serve any useful purpose and for this reason are not in favour of its introduction. We shall give the idea consideration, however, and may introduce such a trolley if a demand for it arises. (*Reply to K. Fowler, Carnforth*).

FOUR-WHEELED WELL WAGONS.—The present Hornby Well Wagon is quite representative of the vehicles used in real practice. We doubt if a smaller wagon of the same type would be popular, and the introduction of one in the Hornby Series is unlikely. (*Reply to C. D. Wood, Peterborough*)

DOUBLE-JUNCTION TURNOUT.—A double Junction turnout in the Hornby Series certainly would enable enthusiasts to take full advantage of the double track now provided. The high cost of manufacture would be an objection to their introduction, but we have these and other track points under consideration. (*Reply to S. Ross, Abergavenny*).

BOGIES FOR METROPOLITAN LOCOMOTIVES.—We agree that the fitting of independent bogies to these locomotives would make them more realistic, but this step would make them more costly to reproduce. Most Hornby Train owners are satisfied with the present pattern. (*Reply to A. Johnson, Wembley*).

"M" TANK LOCOMOTIVE.—We note with interest your suggestion that we should manufacture a tank locomotive of the "M" series. The idea will be given careful consideration. (*Reply to W. Burke, Cork*).

METROPOLITAN 4-4-4T LOCOMOTIVE.—We do not think that the introduction into the Hornby Series of a model of the Metropolitan Railway 4–4–4 Tank Locomotives would be popular, for its outside cylinders would necessitate special construction and this would make their production costly. (*Reply to D. Austin, Northwood*).

With the Secretary

Looking Forward

At the moment of writing the sun is shining fiercely through the windows of my room and it requires a very great effort of imagination to believe that such a thing as winter exists. In spite of that, it is not too soon to look ahead, and, in fact, this should be done now if the interest of members is to be retained.

In saying this I do not mean that the details of next winter's work should be settled immediately, but that during the present month, when members are chiefly interested in outdoor pursuits, leaders and other officials should take every opportunity of thinking over the events of the past sessions, in order to detect any weaknesses in the programmes that have been followed. Plans for remedying these probably will suggest themselves and the result of quiet reflection along these lines will be yet brighter and better work in the coming winter.

Winding up the Summer Session

At this time of the year club funds are usually at their lowest, the expenses of summer excursions and the purchase of materials for games being chiefly responsible for this. Naturally careful officials will take the earliest opportunity of doing something to increase their club's financial resources.

An excellent plan is to hold an open meeting of some kind as a wind-up to the summer session. For instance, if suitable grounds are available a sports meeting or a Garden Fête may be arranged. A well-organised event of this kind makes a splendid finish to summer activities, and if parents and friends of members are invited it may readily be made to yield quite a satisfactory increase in club funds.

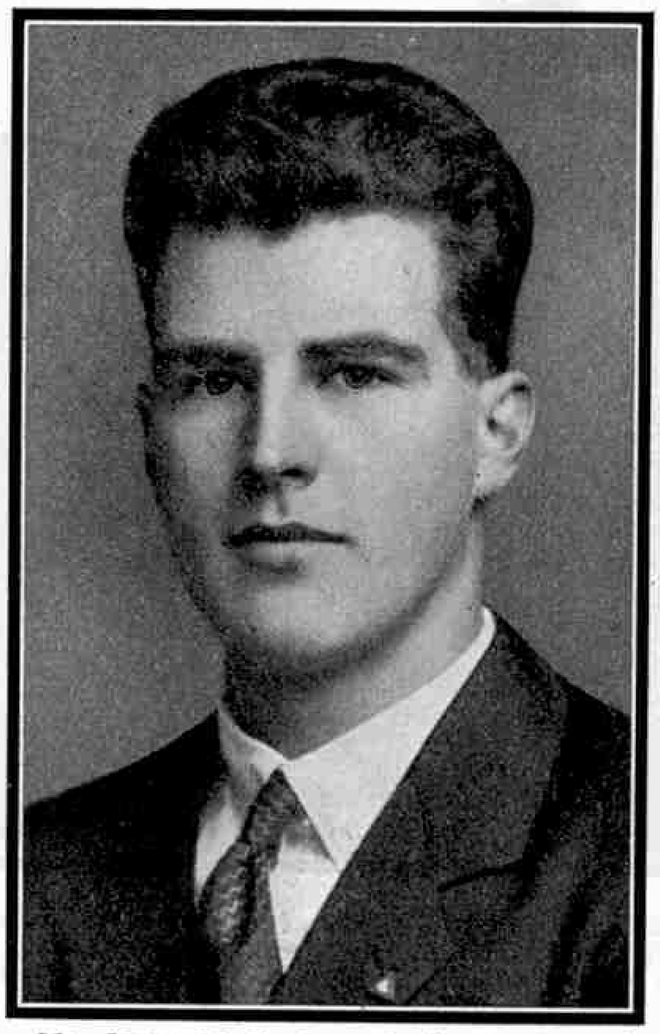
Officials of clubs will have no difficulty in thinking out suitable schemes for an outdoor function of this kind. If it is to take the form of a sports meeting it should be combined with sideshows and other attractions for the benefit of visitors, some of whom may not have the same interest in the sporting events as the members themselves have. If a Garden Fête without sports is arranged, the central feature may be a display of models or a miniature garden railway, while usually it is also advisable to organise an outdoor entertainment of some kind.

A scheme that has been followed with great success by many clubs is the presentation of a pageant. This may consist of scenes of outstanding interest from local history. Great fun may be had in making the necessary preparations and these need not be costly, for a little ingenuity on the part of members, together with assistance from their mothers and sisters, will enable them to produce very satisfactory costumes and to plan what is required in the way of scenery. The episodes chosen should not be of a nature to require elaborate surroundings, and the interest should be concentrated rather on the personages concerned in them.

The sideshows may include a hoop-la stall and similar attractions, while in addition, guessing competitions may be arranged. Good use also should be made of such well-known models as the Meccanograph and the Meccano Bagatelle Table, both of which are particularly attractive to visitors. A railway layout also adds greatly to the interest. This should be made as realistic as possible and an effort should be made to associate with it Meccano models that serve definite railway purposes. For instance, these may include bridges and viaducts constructed from Meccano parts, and also cranes and possibly a warehouse for use at goods stations.

Meccano Club Leaders

No. 46. Mr. J. M. Ferguson



Mr. James M. Ferguson is the Leader and Secretary of the XXVIII Edinburgh Meccano Club. Since its affiliation in March this year this club has made remarkable progress, and recently a very successful Exhibition was held. An interesting summer programme of rambles, cycle runs and other activities is being followed.

Useful Publicity

There are so many attractions available for use at a function of this kind that little difficulty should be experienced by the officials and members of most clubs in arranging one that is successful. While the chief aim is to wind up the summer session in a satisfactory manner, the requirements of the coming winter should not be forgotten, and a little propaganda and publicity work should be undertaken. Among the visitors may be a number of boys who already are interested in Meccano, or are likely to be attracted by the work carried on by the club, and full information regarding it should be made available. Publicity work of this kind may be greatly aided by the use of Meccano advertisements and a selection of suitable posters and Guild literature will be forwarded from Headquarters immediately on receipt of application. An interesting display of these may be made and it is an excellent idea to have the club's affiliation certificate on view, particularly if this is neatly framed.

Proposed Clubs

Attempts are being made to form Meccano Clubs in the following places and boys interested should communicate with the promoters whose names and addresses are given below.

SOUTH AFRICA—James Chapman, c/o Mrs. Barnes, 2, Millwood Flats, Main Road, Kalk Bay.
IPSWICH—Mr. W. F. Wood, 443, Norwich Road.
LONDON, S.E.15—G. Turner, 48, Nunhead Lane, Peckham.
LONDON, N.W.2—L. C. Warshaw, 15, Teignmouth Road, Brondesbury.
OLDHAM—Percy Phillips, 48, Church Road, Shaw.
PENDLETON—Cyril Barnfield, 79, Hayfield Road, Pendleton.
ROPLEY—A. A. Kennett, The Dene Stores, Ropley, Nr. Winchester.

CLUB NOTES

Plymouth (St. Bartholomew) M.C.—On Model-building Nights Competitions have been held for models of Motor Cars and of early Steam Engines. The second of these proved to be a particularly interesting Contest, and excellent models were exhibited. A visit was made to Shaugh Bridge, where members ascended the Dewerstone and on it found traces of an inclined plane formerly used for the transport of granite blocks. The rails of these had been cramped to stone sleepers. Club roll: 27. *Secretary:* R. Matthews, 32, Wésteria Terr., Peverell.

Camborne M.C.—Cricket Matches and practises have occupied most of members' time during the light evenings. Rambles also have been held and a Camping Week is projected. A notable addition to the club's resources is the Library. This now contains a large number of really interesting books. Club roll: 11. *Secretary:* J. Rogers, 47, Hughville St., Camborne.

Hornsea (Hull) M.C.—A Cinema Display was given by Mr. R. Shooter, the Leader, and to this visitors were invited. Lectures on "*Electricity*," "*Wireless*," and "*A Tour Round the World*" have been given, and an interesting talk on "*Coal Gas*" was followed by a visit to the local Gas Works. Club roll: 20. *Secretary:* R. Coverdale, "Seaforth," Belvedere Estate, Hornsea.

Ramsey M.C.—First Aid lessons have been introduced and in these members are greatly interested. General Hobbies' Nights have been held, but the most popular evenings are those devoted to Meccano Model-building. At recent Exhibitions models built by members that were on view have included Airships, Aeroplanes, Cranes, Steam Ships and a Telpher Span. These were greatly admired by visitors. Club roll: 13. *Secretary:* C. Butcher, Princess St., Ramsey.

Ludlow M.C.—The last indoor meeting of the session took the form of a Social. Members are now meeting out of doors for Games, the most popular occupation being Paper Chasing, or at the Baths. Members are greatly interested in Water Polo. Club roll: 21. *Secretary:* Thos. J. Flemons, 23, Corve St., Ludlow.

Kendal M.C.—Model-building Nights, Hornby Train Evenings, and Games Nights occupies chief places on the programme. The Hornby Train Layout of the club is particularly interesting and very realistic work is carried out on it. A Stamp Section is to be formed. New members are required and the secretary will be pleased to hear from boys who wish to join. Club roll: 10. *Secretary:* Alan Brown, 29, Crescent Green, Kendal.

Earlsfield M.C.—A splendid playing field has been secured by the club. A cricket pitch has been prepared by members themselves, and practices and matches on it are enjoyed regularly. A Rummage Sale is being organised in order to raise funds to meet various expenses. Club roll: 16. *Secretary:* D. S. Dye, 15, The Drive, Earlsfield Gardens, Grantham.

Greenock Academy M.C.—The chief of recent events was a visit to the Royal Naval Torpedo Factory. The making of torpedoes was clearly explained and the operation of various machines aroused great interest. After this visit a Competition was held in which prizes were awarded to the members submitting the most complete list of torpedo parts. An outdoor programme is being followed. Club roll: 62. *Secretary:* L. Langtry, 81, Newton St., Greenock, Scotland.

Portsmouth and Southsea M.C.—Members are keen on giving short talks, many of which are impromptu. Among the subjects are included such interesting topics as "*Will men ever reach the Moon?*" and "*Should Submarines be Abolished?*" A very interesting and useful lecture on "*The Use of Metal Working Tools*" has been given. The Exhibition was notable for excellent models of a Flashing Sign, a Sentinel Wagon, an Airship and several Racing Cars. Club roll: 25. *Secretary:* J. S. Kent, 57, Kirby Road, North End.

Hessle M.C.—A successful Debate was held on "*Naval Disarmament.*" At the Open Evening a Lantern Lecture on "*Aircraft*" was given, the slides being kindly loaned by the De Havilland Aircraft Co. Ltd. Models of the High Speed Ship Coaler and Warehouse sent from Headquarters were exhibited, along with a Leyland Titan Omnibus and other interesting models constructed by members. Meetings are now being held in the open air when weather permits. Club roll: 16. *Secretary:* T. A. Fillingham, Marlbro' Avenue, Hessle.

Upwey and Broadwey M.C.—The interesting system has been adopted of allowing members to construct, and demonstrate at club meetings, models of their own design. The subjects of most of these are cranes and other machines employed in the building of the new Harbour Bridge at Weymouth. An extensive Hornby Railway system has been formed, on which "slate" from quarries in the hills is conveyed to the nearest "seaport," a Telpher Span erected by members helping in the process. Mr. R. H. Wright, Leader of the club, has kindly installed electric light in the club room. Cycle tours have been arranged for the summer months and a visit paid to the G.W.R. depot at Weymouth. Club roll: 15. *Secretary:* W. O. Doylend, "Cranford," Jesty's Avenue, Broadwey.

"Botanic" (Hull) M.C.—On a very interesting Contractors' Night model-builders were asked to submit estimates for the construction of parts of an extensive Aerial Ropeway. A "Simplicity" Building Contest and demonstrations of models constructed by members also have been held. An entertaining Debate was held on "*A Humber Bridge v. a Tunnel*," the advocates of the tunnel prevailing. Cycle Runs and Cricket Matches are the chief Summer activities and a tour of the Lake District is to be made, members camping at night. Club roll: 12. *Secretary:* R. Coates, 10, Otterburn St., Hull.

Harehills (Leeds) M.C.—The Second Annual Exhibition was very successful. A full account of the proceedings and of the interesting models on view appeared in the local press. A Debate was held on "*Talkies v. Silent Pictures.*" A party of members, accompanied by others from the Bramley M.C. recently visited Liverpool. The journey was made by road and a call was made at the works of the Leyland Motor Co. Ltd., Preston, where lunch was kindly provided by the firm. In Liverpool the Meccano Factory was visited and members greatly enjoyed their tour of Meccanoland. Club roll: 26. *Secretary:* J. W. Issott, 9, Miland Road, Harehills.

St. Columba's (Sunderland) M.C.—Members are greatly enjoying the Summer Session, interesting Rambles to places of interest, Visits to Works and Cycle Runs constituting the programme. Among the Works visited have been an Aerated Water Factory and Robson's Flour Mills. On the club excursion, Durham is being visited, members having contributed to a club bank to pay for the outing. At indoor meetings Model-building Contests and a Competition for the best display of foreign stamps have been held. Club roll: 32. *Secretary:* T. Crute, 28, Ridley St., Southwick, Sunderland.

Gaywood M.C.—Talks on engineering subjects and Contractors' Nights have proved very popular. The models constructed have included a Model Railway, in building which all members took part. Club roll: 7. *Secretary:* P. F. M. Coverdale, Gaywood, Park Road, Solihull, Birmingham.

The above photograph of a group of members of the Plymouth (St. Bartholomew's) M.C. was taken on the occasion of their visit to Shaugh Bridge, a noted Devonshire beauty spot. The Leader, Mr. B. Y. Williams, is in the centre of the group. The club was affiliated in October, 1926, and has made excellent progress. Model-building Contests of an interesting character form the chief feature of the programme.

Australia

Hobart (Tasmania) M.C.—Regular Model-building Contests are now arranged in two sections, one for members with outfits up to No. 2. and the other for those with larger outfits. Special models were constructed for a Hobbies Exhibition held during "Boys' Week" in Hobart. A Debate has been held on the proposal "*That Submarines Should be Abolished,*" and papers on many interesting subjects have been given by the Leader and members. Mr. R. McKay, Vice President, gave splendid Lectures on "*A Journey on the Australian Transcontinental Railway*" and on "*Bryant & May's Match Factory.*" A visit has been paid to H.M.A.S. "*Albatross,*" the Australian aircraft carrier. Rifle Range Shooting has been introduced, and members are greatly interested in Shooting Contests. Club roll: 18. *Secretary:* Frank Downie, 50, Letitia St., North Hobart, Tasmania Australia.

China

Swatow M.C.—Model-building is the chief pursuit of members, but another hobby in which they are greatly interested is Fretwork. First Aid lessons were given by the former secretary, Mr. H. J. Chan, who has now left to take up business in Singapore. Mr. S. T. Lim, the Leader, is acting as secretary. He has given an interesting Lecture on "*Modern Locomotives.*" Club roll: 10. *Leader and Secretary:* Mr. S. T. Lim, P.O. Box No. 34, Swatow.

Holland

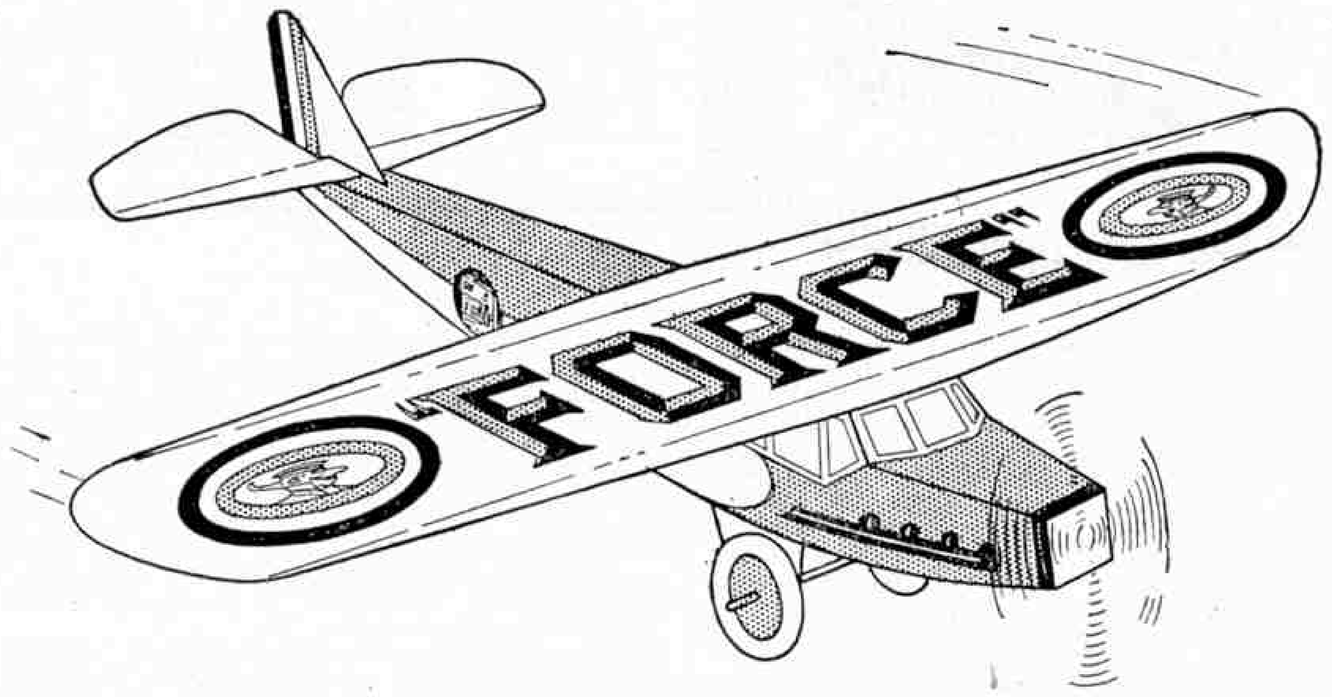
Maastricht M.C.—This newly-affiliated club has secured an excellent club room and several meetings have been held at which members built models for entry in a Competition. A Recruiting Campaign has been successful and an interesting Exhibition of Meccano models has been held. Club roll: 7. *Secretary:* Mr. F. L. Bingen, Mathias Wynandstraat 18, Wyk/Maastricht.

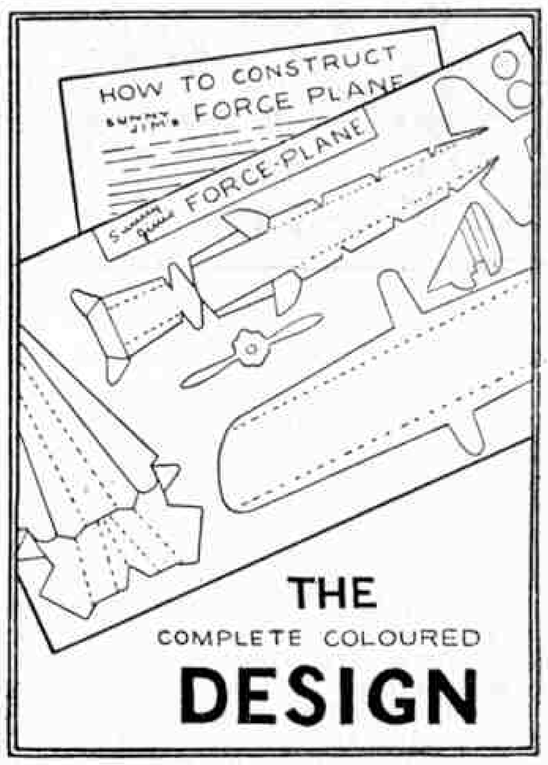
New Zealand

Kaiapoi Methodist M.C.—The arrival of the club's Affiliation Certificate led to an interesting meeting, to which parents were invited. Rev. O. Burnett presided, and gave a splendid talk on the objects and meaning of the Guild. A large number of working models were displayed and at intervals operations were carried out on an extensive Hornby Train Layout. Club roll: 15. *Secretary:* L. Allison, North Road, Kaiapoi, Canterbury.

Manawatu M.C.—Interesting Model-building Competitions have been held, points awarded in these counting in the Contest for the Cup kindly presented by Mr. W. Brown. On the Hornby Train Layout great interest has been taken in the fitting of Hornby Control. The addition of this makes train operations far more interesting. Club roll: 25. *Secretary:* J. Woolf, College House, Box 321, Palmerston North.

THE GLIDING MODEL





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For those who eat "Force".

"Sunny Jim" has designed his own aeroplane. He calls it "Sunny Jim's" Force-plane. It's a wonderful little model, glides twenty to thirty feet. Post to "Sunny Jim" the coupon below, enclosing a 1½d. stamp to cover postage and *one top from a "Force" packet*. You will receive the coloured design, shown in miniature above, on the right, (actual size 10″ x 22″) together with full instructions for making it into the flying "Force-plane."

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Here is a chance for you to learn how aeroplanes fly and perform their hair-raising stunts. You can imagine yourself a miniature pilot behind your miniature plane, studying your controls in the same manner as those clear-eyed, healthy men who fly Britain's "Ships of the Air."

And you can make yourself as fit and vigorous as they are, too. Just get Mother to give you a plate of "Force" and milk every morning for your breakfast. "Force" is a wonderful food, full of valuable vitamins that will build up your strength.

Start with "Force" for breakfast to-morrow and send the packet top for your "Sunny Jim" "Force-plane."

Ask Mother to give you "Force" and Milk every day — the food for Health and strength

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Your Name.....

Your Address .....

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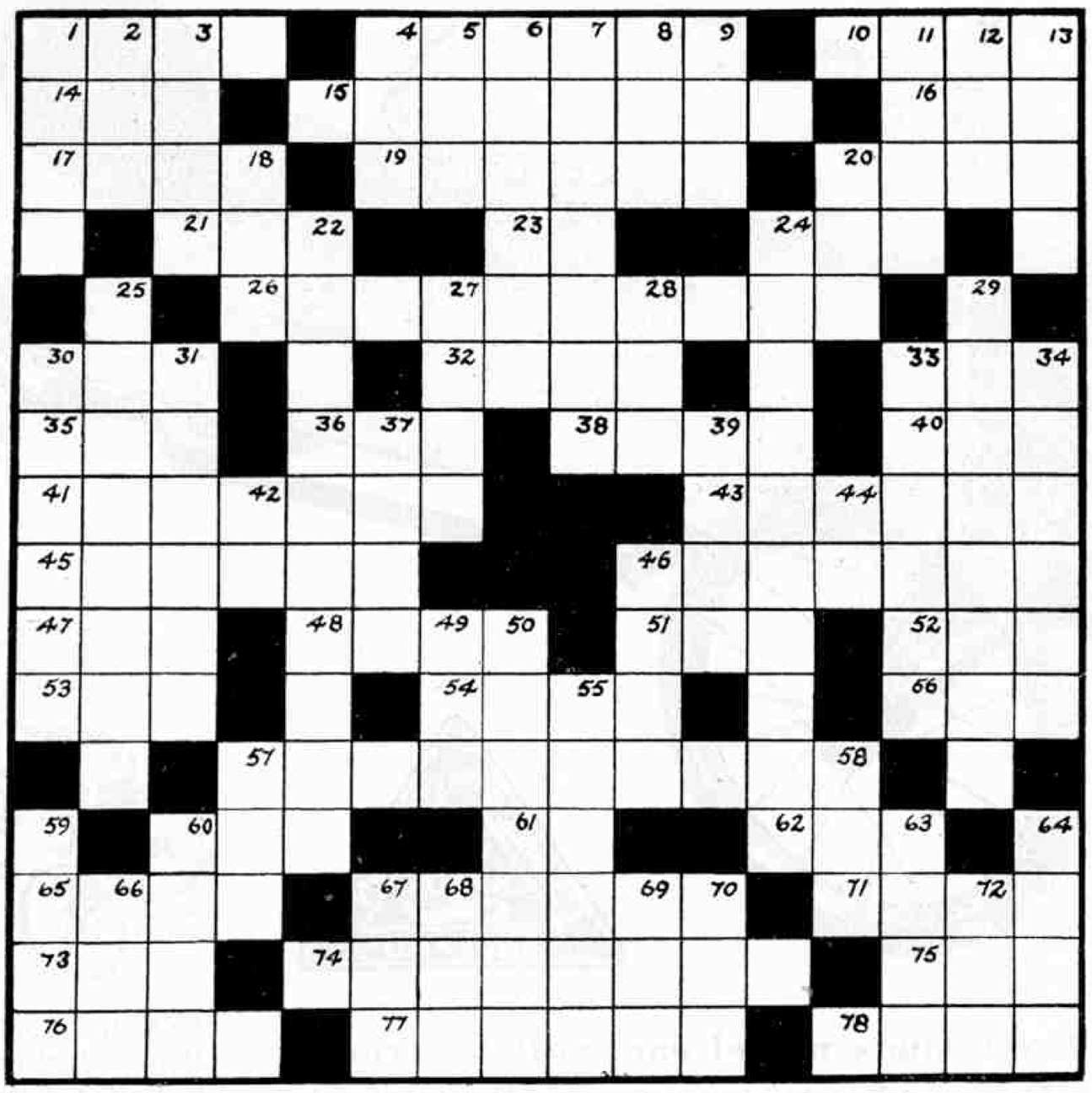
(*This offer applies in Great Britain, Northern Ireland and the Irish Free State only*)

Competition Page

AUGUST CROSSWORD PUZZLE.



CLUES DOWN

1. Programme
2. Fear
3. Flesh Food
4. London County Council (Abbrev.)
5. Part of verb "To be"
6. Vegetable
7. Sent forth
8. Printer's Measure
9. Name at birth
11. Incline
12. Risk
13. Otherwise
18. Resin
20. Deer
22. Adds Emphasis
24. Malicious
25. Part Song
27. Fish (Pl.)
28. Cutting Tool
29. Huge Number
30. Receptacle for Scrap Linen
31. Born
33. Ordains
34. Away
37. Cuts
39. Yorkshire River
42. Southern Latitude (Init.)
44. Famous Scottish School (Init.)
46. Instrument
49. Merry Month (Fr.)
50. Ambassadors
55. Roots
57. Irresponsible.
58. Evil
59. Thin strip of wood
60. Pointed Post
63. Famous ex-President of U.S.
64. Hire
66. Ventilate
67 Face
68. Port of London Authority (Abbrev.)
69. Faded out
70. Glum
72. Compete

CLUES ACROSS

1. Enthuse
4. Sail
10. German River
14. Indebted
15. Packed together (Football Term)
16. Fish
17. Duck
19. Colour
20. Vermin
21. Rules
23. N.T. (Act.)
24. Relative
26. Kindly disposed
30. Service Arm (Initials)
32. Top
33. Period
35. Fuss
36. Possessive Pronoun
38. Dignitary of Church
40. Point
41. Varieties of Herbage
43. Aims
45. Wave
46. Sticky Liquid
47. Period
48. Girl's name
51. Above
52. Metal
53. Wander
54. Male voice
56. Wastrel
57. Exact
60 Level
61. Degree of Hardness
62. Rest
65. Placed
67. Varying rates of movement
71. Part of Church
73. To be unwell
74. Genus of Plant
75. For cooling purposes
76. Journey
77. Overcome
78. Leave alone

The popularity of the crossword puzzle seems evergreen, and as quite a number of readers recently have asked for another competition of this kind, we are taking the opportunity of its extreme suitability as a holiday competition to set one this month.

The rules governing the solution of crossword puzzles require no explanation, but, nevertheless, we would like to make it quite clear to new readers that in setting the clues it has been our endeavour throughout to avoid creating unfair traps. At the same time, of course, the clues have had to be wrapped in a certain amount of mystery. Every word will be discovered to be quite straightforward, however, and may be found in Chamber's 20th Century Dictionary or any other good dictionary.

Prizes of Meccano Parts or Hornby Train Accessories (to be chosen by the winners) to the value of 21/–, 15/–, 10/6 and 5/– respectively, will be awarded to the senders of the first four correct solutions in the order in which they are opened on the morning following the closing date. In addition there will be a number of consolation prizes, and in awarding these neatness and style of presentation will be taken into consideration.

Competitors who wish to preserve their "*M.M.'s*" intact need not cut out the crossword illustration. It will be in order to make a copy of the illustration and fill that in.

Entries should be addressed to "August Crossword Puzzle, Meccano Magazine, Binns Road, Old Swan, Liverpool," and must be sent to reach this office not later than 30th August. Overseas closing date, 29th November.

August Photographic Contest

In accordance with the announcement in our April issue, our photographic contests this year do not require competitors to submit photographs of any special subject, and the monthly contests are simply for the best photographs submitted each month, irrespective of their subjects.

The entries to the competitions will be divided into two sections, A for those from readers aged 16 and over, B for those from readers under 16. Prizes of photographic materials or Meccano products (to be selected by the winners) to the value of 21/– and 10/6 respectively will be awarded to the best and second-best entries in each section.

Each competition will be known under the name of the issue in which it is announced. Thus all entries sent this month should be addressed to "August Photo Contest, Meccano Magazine, Binns Road, Old Swan, Liverpool." They must reach this office not later than 30th August. Overseas, 29th November.

Competition Closing Dates

HOME.

August Crossword Puzzle ...	30th August.
August Photographic Contest	30th August.

OVERSEAS.

Cut-Outs No. 1...	30th August.
May Photographic Contest ...	30th August.
Cricket Voting Contest ...	30th September.
June Photographic Contest ...	30th September.
Cut-Outs No. 2...	31st October.
July Photographic Contest ...	31st October.
August Crossword Puzzle ...	29th November.
August Photographic Contest	29th November.

Watch the Closing Dates:

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of any competitions for which they intend to enter.

Competition Results

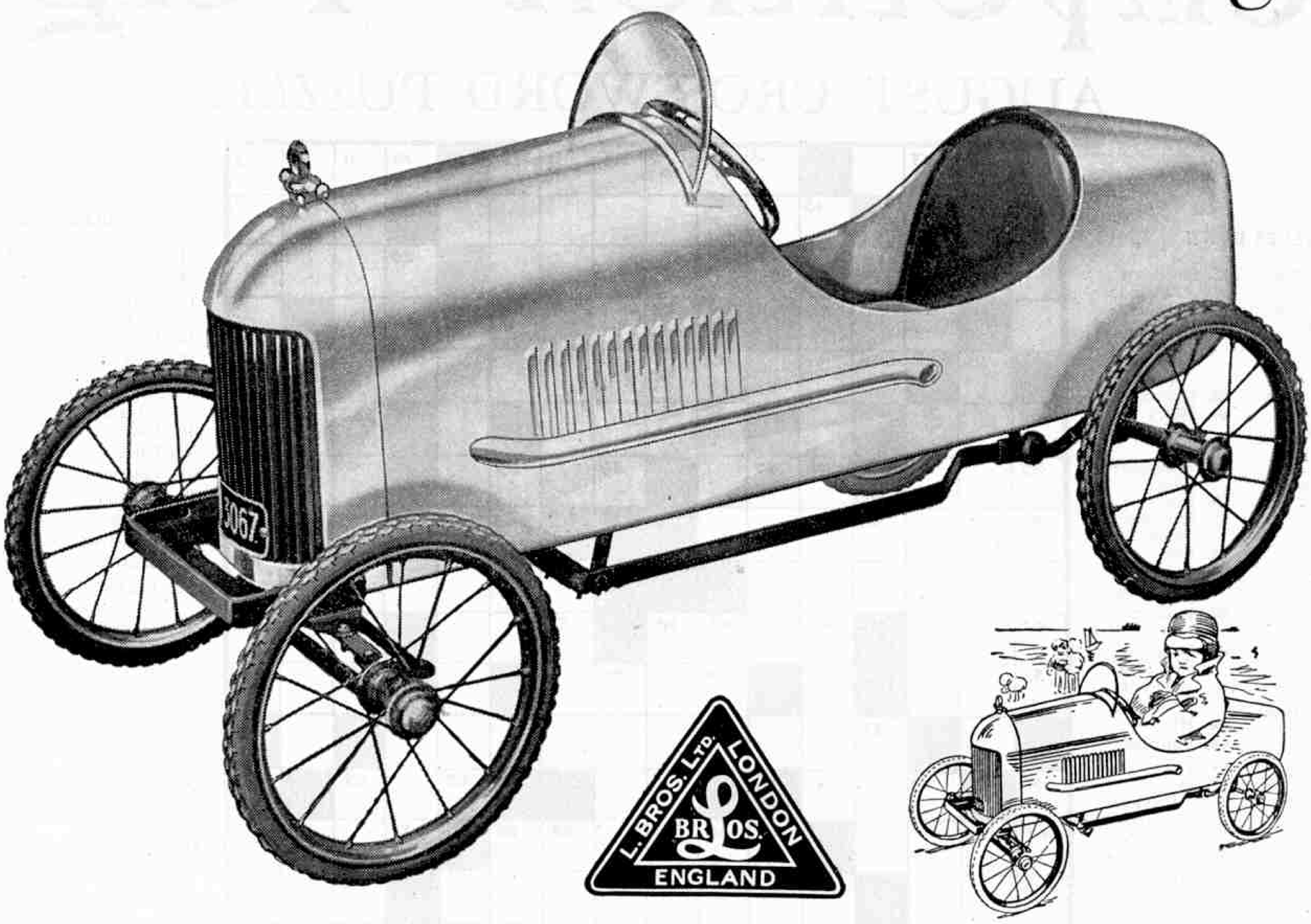
Cut-Outs.—First Prizes: Section A, Miss A. Oldroyd (Sydenham, S.E.26); Section B, Wm. Stewart (Lenzie, Glasgow); Second Prizes: Section A, L. Matthews (Bristol); Section B, F. E. Wilde (Treherbert, Glam.). Consolation Prizes: D. Alford (Carlisle); R. Barbour (Pitlochry); L. G. Barston (Wolverhampton); C. Bentley (Derby); C. Curry (Chester-le-Street); M. Holland (Isleworth); J. D. P. O'Leary (Bromsgrove); C. H. McCale (Cardiff); T. Sadler (Winsford, Ches.); M. Wagstaff (Oxford); J. M. Watson (Bristol); J. White (Glasgow); S. Wilson (Edinburgh).

May Photo Contest.—First Prizes: Section A, A. M. Edwards (London, N.W.8); Section B, J. A. Wagstaff (Worcester); Second Prizes: Section A, F. Matson (Faversham); Section B, J. A. Baldwin (St. John's Wood, N.W.8). Consolation Prizes: G. E. Chamberlain (Plumstead, S.E.18); A. B. Chatfield (Crewe); T. L. Hare (Tunbridge Wells); Miss P. Hawks (Shortlands); G. S. Parker (Southampton).

OVERSEAS

Jungle Escape.—1. J. Christie (Seremban, F.M.S.); 2. K. Bush (South Canterbury, N.Z.); 3. G. Marshall (Toronto); 4. A. Brooks (Taranaki, N.Z.); Consolation Prize: J. A. Rodriguez (Montreal).

This car is the real thing!



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Yes, it's a Brooklands model car built by Tri-ang engineers. They said: "Let's make this Brooklands car sporty and splendid; let's make it strong—and let's make it *safe*." So they fitted it with a polished aluminium body and radiator and gave it a stunningly smart finish by covering the chassis and wheel rims with brilliant red enamel. Then they fitted it with a ball-bearing back axle, double crank drive and real rubber pedals. And they added that long natty exhaust pipe because they knew you would like it. Now when is your birthday?

BROOKLANDS No. 6 . 63/-
Polished aluminium body, red chassis and wheel rims, tangent spoke wheels with 1" imitation pneumatic tyres, windscreen, seat padded in red cloth. For ages 4-8yrs.

BROOKLANDS No. 8 . 105/-
As No. 6, but with 2¼" Dunlop balloon pneumatic tyres, heavy tubes and Schrader valves. For ages 4-8 yrs.

BUICK EMPIRE 95/-
A chain drive motor with every possible detail of equipment. Ball bearing back axle and pedal bracket. Side door opens. Safety glass adjustable screen, balloon wheels. For ages 4-8 yrs.

CHEVROLET REGAL . 32/6
A beautiful car with steel chassis and moulded steel body. Easy running double crank drive with rubber pedals, back axle is ball bearing. Balloon wheels with ⅝" rubber tyres. For ages 4-7 yrs.

ROVER REGAL 42/-
All steel body is mounted on steel chassis with four cantilever springs. Model of Rover radiator with correct badge gives a very handsome appearance. Full complement of accessories is included. For ages 4-7 yrs.

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MOTOR CARS 15/- TO £15-15-0

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★ Tri-ang cars are on view at most Toy shops. Write for folder of Tri-ang Cars and other Tri-ang Toys, illustrated in full colours. **Free on request.**

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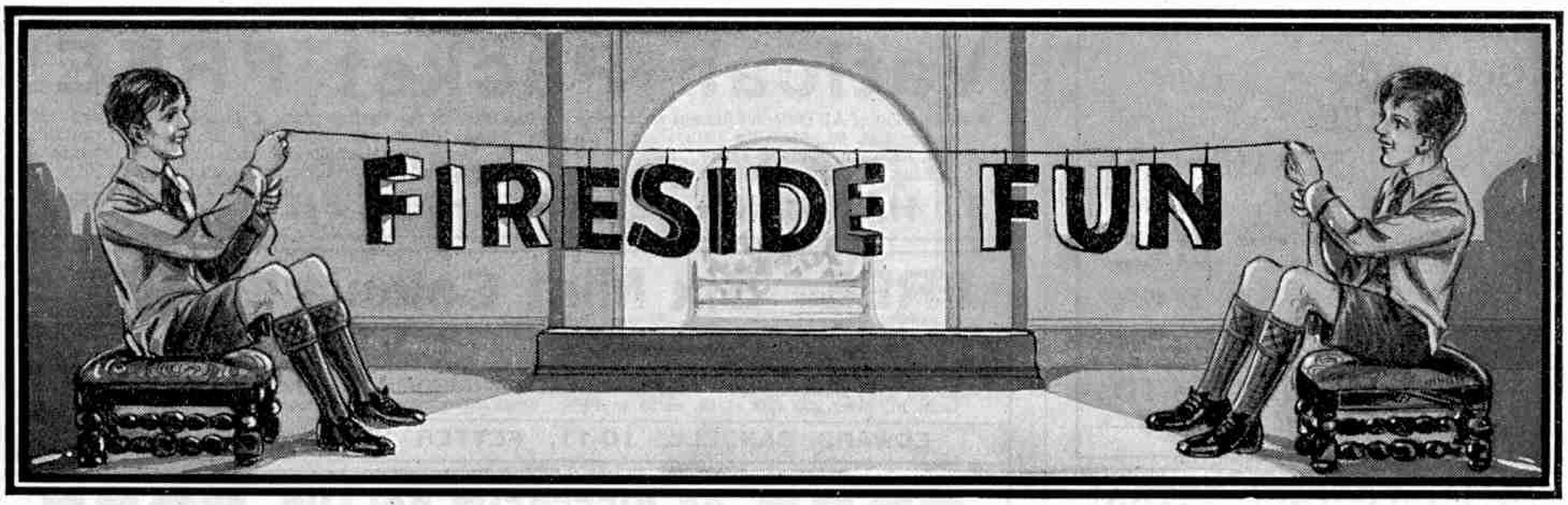


A SWARM OF WORDS!

The Frenchman was disgusted with the English language. "For example," he remarked, "take the word 'crowd.' This means a lot of people. That is easily learned. But a crowd of ships is termed a fleet, while a fleet of sheep is called a flock; on the other hand a flock of girls is called a bevy, and a bevy of wolves is called a pack. A pack of thieves is called a gang, while a gang of fish is called a shoal. A shoal of bullocks or buffalo is called a herd; a herd of soldiers is called a troop; a troop of partridges is called a covey; a covey of beauties is called a galaxy, and a galaxy of ruffians is called a horde. A horde of logs is called a heap; a heap of oxen is called a drove; a drove of blackguards is called a mob; a mob of robbers is called a band, and a band of bees is called a swarm!"

A swarm of words must be an essay!

* * * *

Mother: "Johnny, why do you eat more pie when we have company than when we're alone?"

Johnny: "We have pudding when we're alone."

* * * *

Billy: "What does your brother work at, Tommy?"

Tommy: "He's in the Talkies."

Billy: "What part does he take?"

Tommy: "He's the approaching footsteps in the murder scene."

* * * *

Lion Tamer (to assistant): "Come back here; that lion is tame; and besides, it was raised on milk."

Assistant: "So was I raised on milk, but I eat meat now."

* * * *

The Squire: "Do you give your dog any exercise, Mr. Giles?"

Farmer Giles: "Oh yes, he goes for a tramp every day."

* * * *

"A piece of beef for roasting," said the business-like man as he stepped into a butcher's shop.

The meat, mostly bone, was thrown on the scales.

"Look here," remonstrated the man, "you're giving me a big piece of bone."

"Oh, no, I ain't," said the butcher grumpily. "You're paying for it!"

* * * *

TAKING NO RISKS

"Go on in, Sambo," the farmer called out. "He won't hurt you. You know a barking dog never bites."

"Sure, boss, ah knows dat," replied the cautious coloured man, "but ah don't know how soon he's gonna stop barking."

* * * *

He: "A wagon maker who had been dumb for years picked up a hub and spoke."

She: "Yes, and a blind carpenter on the same day reached out for a plane and saw; a deaf sheep ranchman went out with his dog and herd; a noseless fisherman caught a barrel of herring and smelt; and a forty-ton elephant inserted his trunk into a grate and flue."

HARD TIMES AT THE JAIL

"Three men go free this morning, warder. That leaves us only one prisoner in our jail."

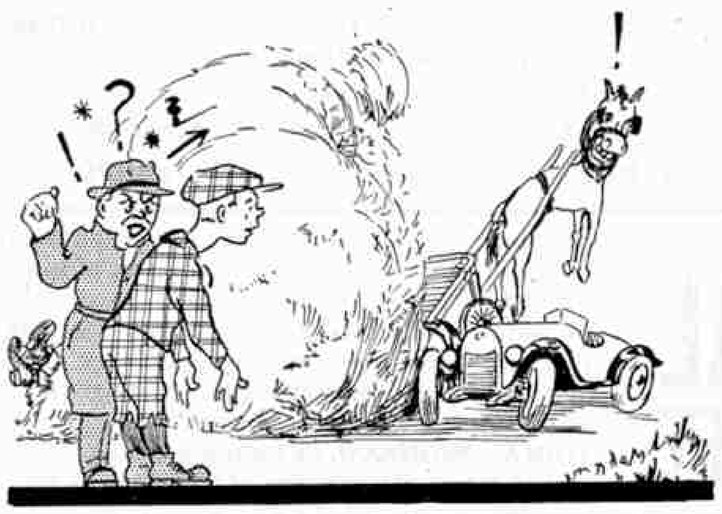
"It's hard times, old man. If nothing better turns up we'll have to make him do another six months."

* * * *

Young Chemist's Assistant: "I've made up the medicine for you, madam, and I'm sure it's all right—but in case I've made any mistake perhaps you wouldn't mind signing your name in the poison book."

* * * *

WEIGHTY EVIDENCE!



"Hadn't you better go and tell your father?" said the motorist to the farmer's boy, who stood looking at the load of hay upset in the lane by a collision.

"He knows," replied the boy.

"Knows? How can he know?"

"He's under the hay."

* * * *

A pushing young actress was given a small part in which her sole task was to answer the telephone. She considered that she did this job sufficiently well to merit a better part, and accordingly interviewed the manager and stated her case.

"Let's see," said the manager, "you answer the phone, don't you? Um. Well, I'll tell you what we'll do, Miss Blank. From to-night we'll make it a trunk call."

* * * *

Little Albert came home from school with a new book under his arm. "It's a prize, mother," he said.

"A prize? What for, dear?"

"For natural history. Teacher asked me how many legs an ostrich has and I said three."

"But an ostrich has two legs."

"I know that now, mother, but the other boys in the class said four; so I was nearest."

* * * *

Barrister (cross-examining a witness): "You seem to have plenty of intelligence for a man in your position."

Witness: "If I wasn't on oath I'd return the compliment."

* * * *

"Who helped you with your homework, Jones?" asked the master.

"Nobody, sir."

"Now, come, come, that's not true," said the master, sternly. "Was it your father?"

"N-no, sir. He didn't help me—he did it all himself."

* * * *

Impatient Customer: "Can't you wait on me? Two pounds of liver. I'm in a hurry."

Butcher: "Sorry, madam, but two or three are ahead of you. You surely don't want your liver out of order!"

* * * *

"What keeps the moon from falling?"

"It must be the beams."

* * * *

Foreman: "You can begin by helping the riveters on top of this skyscraper frame."

Green Apprentice (looking dubiously at dizzy skyscraper top): "Naw, sir! Pa said for me to start at the bottom and work up!"

NOT THE FOREMAN'S FAULT

"All right!" said the slow-working bricklayer. "Keep your hair on! Rome weren't built in a day, you know."

"That may be," the foreman vociferated. "I wasn't in charge there."

* * * *

Inspector: "Got away, has he? Did you guard all the entrances?"

Country Constable: "Yes, but we think he must have left by one of the exits."

* * * *

Employer: "These references are all in the same handwriting. Are you sure they are genuine?"

Applicant: "Well you advertised for a man with a lively imagination, and I used mine in preparing them!"

* * * *

Mother: "Johnny, if you eat any more cake, you'll burst."

Johnny: "Well, pass the cake and get outa the way."

* * * *

Foreman: "Why are you turning in the job? Can't you stand the noise?"

Riveter: "Well, I don't mind hammering rivets all day long, but my mate is always whistling and it gives me a headache."

* * * *

Teacher: "Why are the summer days longer than the winter days?"

Scholar (brightly): "Because the heat expands them."

* * * *

Stern Father (to son departing for boarding-school): "Now don't let me hear any bad reports about you."

Son: "I'll try hard, dad. But you know how these things leak out."

* * * *

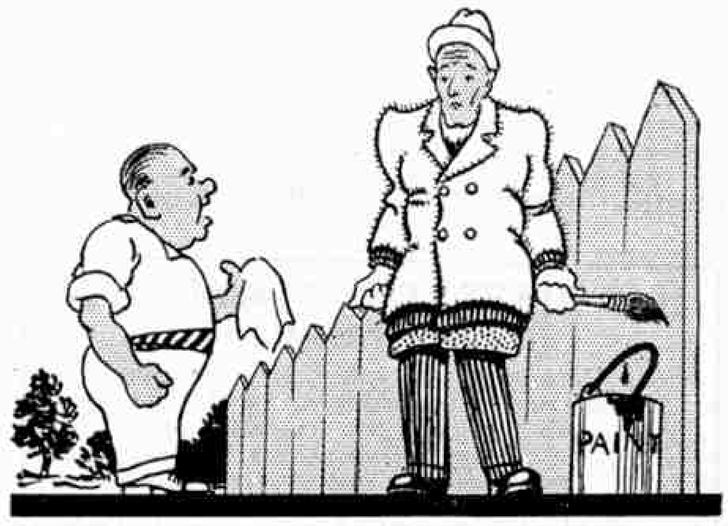
Little Betty was busy with her homework, and her mother saw she had written, "King John was a very wicked king. He was always killing people with his motor-cars."

"But, dear," mother said, "that isn't right. There were no motor-cars in those days."

"Well, mother," Betty replied. "It says in my history book that King John ground the people down with taxis!"

* * * *

FOLLOWING INSTRUCTIONS



Smith: "Hello! Jones, why on earth are you wearing all those clothes on this blazing day?"

Jones: "Well, I'm going to paint the garden fence, and it says on the paint tin: 'To obtain the best results, put on three or four coats.'"

* * * *

Father, Mother and son lived in one of New York's highest skyscrapers. One morning, attracted by her little boy's cries, the mother rushed into the room and found him leaning out of the window.

"What's the matter, sonny?" she asked.

"Father's fallen out of the window."

"Oh! Is he hurt?" shrieked the mother.

"Not yet," replied the boy. "He ain't stopped falling."

OUR BIG
FREE
STAMP LIST

and list of albums will really interest you. Please write for them and tell us whether we may send you approval sheets of your favourite countries.

STANLEY GIBBONS LTD.,
DEPT. S.15, 391 STRAND, LONDON, W.C.2.

SETS (POSTAGE EXTRA)

10	Finland	...	2d.	20	Bavaria	...	2d.
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20	,,	...	4d.	30	,,	...	4d.
25	,,	...	6d.	35	,,	...	6d.
30	,,	...	8d.	40	,,	...	8d.
35	,,	...	10d.	45	,,	...	10d.
40	,,	...	1/-	50	,,	...	1/-
45	,,	...	1/3	55	,,	...	1/3
50	,,	...	1/6	60	,,	...	1/6
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25	,,	...	3d.	15	,,	...	3d.
30	,,	...	4d.	20	,,	...	4d.
35	,,	...	5d.	25	,,	...	5d.
40	,,	...	6d.	30	,,	...	6d.
45	,,	...	7d.	10	Dantzig	...	2d.
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J. RUSSELL,
Chetwynd, Shanklin Drive, Westcliff-on-Sea.

Vatican Packet FREE!

A fine packet of **All Different Stamps** containing the new issue of the **Vatican State, a Jamaica 2/-, Hayti** 1904 Centenary **Cat. 9d., Medellin** 1913 Unused pictorial, **Indore, Cilicia** surcharged **Cat. 3d., Central Lithuania, Deccan, Lebanon, Kouang-Tcheou, Bulgaria** pictorial, **St. Pierre and Miquelon, Victoria** 1901, etc., free to all asking to see my famous approval sheets and **enclosing 2d. for postage and packing (abroad 3d.).**

S. HAMMOND, 2, CHESHAM FIELDS, BURY.

FREE Six Mint Colonials FREE

I send FREE SIX MINT BRITISH COLONIALS, one each from KEDAH, ZANZIBAR, Kenya, TURKS & CAICOS Is., SOUDAN and CAYMAN ISLANDS—and ALL MINT, to any collector at Home or Abroad sending a postcard for my large Illustrated Price List (No. 8) containing over 1,200 items: Stamps, Albums, Sets, Packets, Accessories—in fact EVERYTHING FOR THE STAMP COLLECTOR. Prices from 1d. (over 200 sets at 1d. each) to 40/-. Send a postcard only—no cash—and ask for No. 200.

EDWARD SANDELL, 10-11, FETTER LANE, LONDON, E.C.4

FREE 25 DIFFERENT POLAND FREE

Including old and recent issues, showing eagles, views, horsemen, sower, sailing ship, etc. Many scarce varieties of perforation to be found. I will present this collection (catalogue value 2/4) absolutely free to all stamp collectors sending 2d. postage. Only one gift to each applicant.

G. P. KEEF, Mortimer Lodge, Wimbledon Park, LONDON, S.W.19.

FREE. 100 DIFFERENT

This wonderful offer includes a fine range of **British, French,** and **Portuguese Colonial** stamps, also set of **Danzig,** etc., mostly fine Pictorials.

FREE to Genuine Approval Applicants.

J. BURTON, 31, ONSLOW ROAD, LIVERPOOL.

TASMANIA PACKET FREE

This **Excellent** Packet contains **474 Unsorted Foreign** Stamps collected for us by **Convents Abroad;** many scarce Stamps have been found in this mixture. A **Set** of **Scarce Tasmania** with Queen Victoria, **Antioquia** unused, **Newfoundland,** Obsolete **Gold Coast, Nyassa** unused, Obsolete **South Africa, Venezuela,** etc., etc., are included.

Offered **Free** to Genuine applicants asking for **Half-Price** Approval Sheets enclosing **2d.** stamp for postage. (Abroad 8d. P.O.) Mention TASMANIA.

HORACE MILLER & CO., WHITSTABLE, KENT.

THE "ORIENTAL" PACKET

This packet contains **30** *good class* **Oriental** stamps only (no common continentals) and is mostly comprised of beautifully printed pictorials, views of towns, ruins, mosques, minarets, gateways, etc. Set of **Palestine,** set of **Egypt** (large pictorial, King Fuad, etc.). Set of **Turkey** (including "Wolf" type). Set of **6 Algeria** (including 50c. and postage due). **Mesopotamia** (large pictorial). **Syria** (pictorial). **GRAND LIBAN** Pictorial (surcharged with Aeroplane for Air Service). Set of **3 Persia** (obsolete). **ALAOUITES** (Minaret). Set of **8 Tunis** (new issue, pictorials, postage due, etc.). **Price 4½d.** only, postage 2d. extra (abroad 2½d. extra). **Purchasers** of the above packet asking for approval sheets will be presented with a unique set of **10 PICTORIAL MOROCCO,** including Air post. This *fine* set is usually sold at a 1/-. Satisfaction guaranteed or money returned. Senders of addresses of stamp collecting friends will receive another set in addition **FREE.**

H. C. WATKINS, M.M. Dept., Granville Road, BARNET

Have You Seen Them?

MY RECORD APPROVALS.

Huge discount of 8d. in 1/- allowed, or 9d. in 1/- for a nett purchase of 2/6 or more. My approvals being **absolutely the cheapest and best, no free gifts** are given.

RECORD STAMP COMPANY,
23, Canning Road, East Croydon.

FOR FIFTY YEARS

we have been sending out sheets of stamps on approval. Every stamp we sell is fully guaranteed, is specially selected and priced at the lowest possible figure. Ask for some to be sent you for inspection.

For 30 days (abroad 90 days) we will present absolutely free to all applicants enclosing 1½d. for postage a beautiful **first issue Costa Rica** stamp if the application is addressed to—Department 56, **ERRINGTON & MARTIN, South Hackney, London, E.9.**
Established 1880.

1000 DIFFERENT STAMPS 1000
ON APPROVAL

from which you may select any 100 for 3/-. This selection is **not** made up of the thousand commonest stamps, but contains specimens priced by Stanley Gibbons up to 1/- each. For 3/- you have the opportunity of choosing 100 stamps of the catalogue value of 20/- or more.

H. HARDY, 285, Archway Road, London, N.6.

FREE THE GREATEST GIFT OF ALL

To those asking to see our Famous Approvals and List of Stamp Bargains we will give 300 GENUINE COLONIAL & FOREIGN STAMPS.

No Duplicates. All Different. (Cat. over 25/-). 4d. stamps to be sent towards packing and postage (overseas 6d.).

WITHOUT APPROVALS, price is 1/7
R. WILKINSON, Trinity St. W., Llandudno.

THE "BOY KING" PACKET AND COLLECTOR'S OUTFIT FREE!!

DUPLICATE STAMP ALBUM **25 CZECHO-SLOVAKIA**
POCKET CASE **PERFORATION CASE** **PACKET "LIVER" MOUNTS**

A really marvellous offer. The "BOY KING" Packet contains 2 beautiful portrait stamps of the world's youngest ruler, over 25 unused stamps, many surcharged, War and Post War, and all the above stamps and accessories. All fine stamps and absolutely free. Send 2d. postage requesting approvals.

LISBURN & TOWNSEND (DEPT. M.M.), LIVERPOOL

STAMPS FOR THE NATION!

Junior Guaranteed AGENTS still WANTED in Schools and Districts to MAKE MONEY.
Why not write for details and join? It will cost you nothing!
You will soon be sending testimonials like the following just received "I have made money out of each of the (three) selections you have sent. Please send more." (Huddersfield). "I should like to thank you for the exceedingly useful free gift and must say that your selections are by far the best and cheapest I have yet seen." (Banbury). "Your stamps are only a quarter of the price dealers have been charging me." (Blackburn), etc., etc.
Join now to be ready for the new season.
Each new J.G.A. this month has a choice little lot value 5/- presented free by our Chairman.
THE NATIONAL STAMP ASSOCIATION LTD. (Collectors). Correspondence only.
30a, HIGHGATE ROAD, LONDON, N.W.5.

100 Different Stamps Free. Send for ½d. Approvals.—Cox, 3, Mornington Mansions, Westcliff.

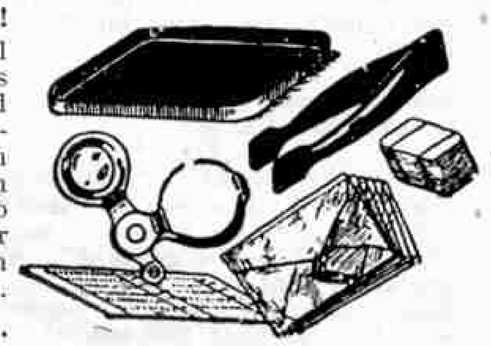
100 STAMPS, cat. over 10/-, for 1/1½.—Jones, 379, Shaftmoor Lane, Hall Green, Birmingham.

FREE. 25 Oriental Stamps to approved applicants and buyers of my "Golden Packet" of 20 Mint Syrian Stamps (many Air Mail) at 1/- in Unused Stamps. K. Aboul-Jahab, Salon d'Esperance, Beirut, Syria.

HANDSOME METAL STAMP CASKET FREE!!

The Greatest Gift ever offered to Stamp Collectors!
Comprising: **Watermark Detector,** All Metal **Perforation Gauge, Rustless Tweezers,** Marvellous **"Matlock"** Mounts, Transparent Envelopes and famous **Stamp bearing Mail Aeroplane,** all contained in Handsome Metal Gift Casket with Hinged Lid, showing the highest precipice in England at Matlock—the Home of Stamp Collecting. Send 3d. and request approvals—or if 4d. be sent a **Powerful Magnifying Glass** in Folding Metal Case will be included in the Casket.

VICTOR BANCROFT, MATLOCK, ENGLAND.



For further Stamp advertisements see page 672.

Stamp Gossip

Railway Stamps

It is a considerable time since the stamp world received a new railway design, and the recent Guatemalan issue celebrating the opening of Los Altos electric railway is therefore of special interest. It consists of three stamps, 2c., 3c., and 5c., on which are shown respectively a railway embankment, the Pyrenees bridge and a section of permanent way, and a station en route. The design of the 3c. value, illustrated here, is particularly interesting in that the section of track shown gives no indication that the line is operated by electric traction.

At the time of the opening of the railway the new stamps were not quite ready and the event was first celebrated by the temporary re-issue of the 15 pesos railway design of 1921, suitably overprinted.

Another railway issue comes this month from Eritrea, Italy's Red Sea colony, the 2 lire value of the new definitive issue, reproduced on this page, showing a train of observation cars crossing a viaduct. This stamp, incidentally, provides an interesting contrast in types of transport, for a camel and rider are to be seen coming through the centre arch of the viaduct.

Eritrea's issue, which is to replace the many provisional issues that have done duty in recent days, gives several other interesting designs. For instance, on the 15c. value here illustrated is seen a representation of a native telegraph linesman at work. The remaining stamps

and the designs on them are as follows: 2c. and 35c., Lancer, 5c. and 10c., Postman; 25c. Rifleman; 1 lire, a camel caravan at Massouahe; 5l., Asmara Deghe Selam; and 10l., another camel transport scene.

Stamps up to 35c. in value bear upright oblong designs, and those of higher value are of horizontal oblong shape.

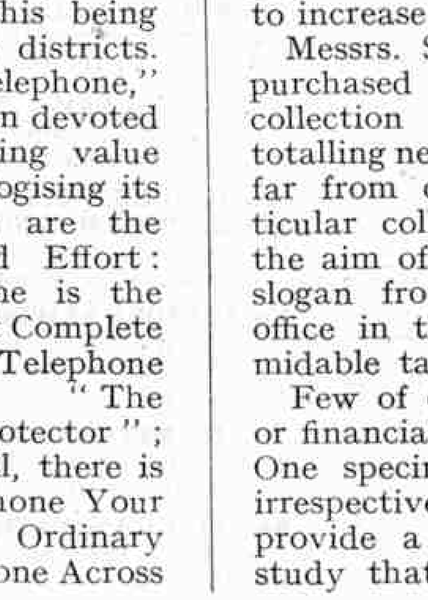
A New Zealand Slogan Campaign

The suggestion, made in the stamp article in the "*M.M.*" for December, 1929, that a collection of postal slogans would prove particularly attractive as a modern study, seems to have aroused a considerable degree of interest and already we have heard of many readers who have commenced the formation of such a collection. As a matter of curiosity, we have made a point of preserving every slogan-bearing letter that has come into our possession since December and we have been amazed to discover how great a scope is offered.

It is a little too soon to offer any extensive comment on postal slogans in general, but one outstanding feature, a New Zealand telephone campaign carried on by this means, seems worth noting. In it we have traced the use of 12 different slogans, most of which have appeared in two styles of make-up—one in which the wording is contained in neat "boxes" accompanied by the customary circular cancellation being used in the case of the large towns and cities; and a second with the wording and date stamps perched, as it were, on a five-barred gate, this being employed in the less populous districts.

The first slogan, "Say it by Telephone," was inevitable. Others have been devoted to driving home the time saving value of the telephone system and eulogising its convenience. Among these are the following: "Save Time and Effort: Telephone"; "The Telephone is the New Necessity"; "Home is not Complete Without a Telephone"; "The Telephone Unites Scattered Families"; "The Telephone is the Home Protector"; "Even if You do Miss the Mail, there is Still the Telephone"; "Telephone Your Friend in the Other Island: Ordinary Toll Rates"; "You can Telephone Across Cook Strait: Ordinary Land Charges."

The already "converted" were not omitted from the campaign, and three slogans were used to persuade telephone users to extend their facilities: "An Extension Telephone Costs but a Penny a Day," subscribers were told. In addition, they were exhorted to "Save Steps. Get an Extension Telephone" and to "Avoid the Stairs. Get an Extension Telephone."



It is yet early to say what effect this enterprising campaign has had upon the New Zealand telephone service, and, of course, we are more concerned with the postal rather than the advertising aspect of the campaign. Nevertheless, upon the results of this and similar campaigns must depend the cessation, continuance or extension of this form of postmarking device, and most definitely we are interested in this aspect.

The general adoption of the slogan postmark must result in the almost complete disappearance of what are known as "superb" used stamps among the cheaper denominations, for the marks employed completely obliterate the stamps. A careful examination of some 200 foreign covers bearing slogan postmarks revealed less than 10 stamps fit for inclusion in a collection, and only one of these would have satisfied a really discriminating collector! Obviously, then, the extended use of heavy slogan postmarks must tend to increase the value of good used stamps.

Messrs. Stanley Gibbons have recently purchased an exceptionally interesting collection of slogan-postmarked covers, totalling nearly 8,000 in number. Although far from complete, of course, this particular collection has been formed with the aim of including a specimen of every slogan from every slogan-marking post office in the world, an exceedingly formidable task!

Few of our readers will have the time or financial ability to work on these lines. One specimen of each slogan, however, irrespective of the office of issue, would provide a wide field for an interesting study that will extend its range as the popularity of this form of advertising grows. Alternatively, a collection of pictorial slogans could be made. There have been many such recently. There spring to mind quickly the Canadian and American "Air Mail" slogans illustrated with line drawings of aeroplanes. Canada's "Post Early for Christmas" slogan showed a picture of Santa Claus loaded down with parcels to deliver, and Jamaica has used a line drawing of hills and palm trees to feature its attractions as a health and holiday resort.

The scope here is considerably smaller than in forming a general slogan collection, but for the collector with limited time to give to the subject it is probably the more promising line to take.

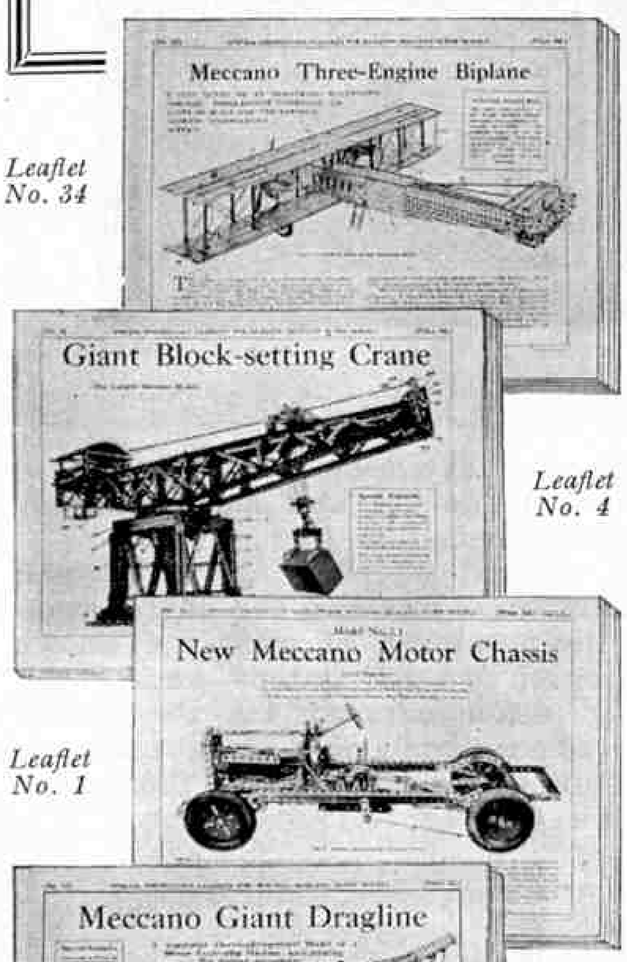
MECCANO SUPER MODELS

INSTRUCTION LEAFLETS

Our expert designers have produced for us 37 super models that reach the highest pinnacle ever attained in Meccano construction. Each model in this series is a masterpiece and there is not a boy who will not be eager to build them all.

These models are so important that we have published a special leaflet with beautiful half-tone illustrations for each of them. A selection of the leaflets is illustrated on this page.

A brief description of each model in the series is given below. Copies of the leaflets may be obtained from any Meccano dealer or direct from us, post free, at the prices shown at the foot of the page.



Leaflet No. 34

Leaflet No. 4

Leaflet No. 1

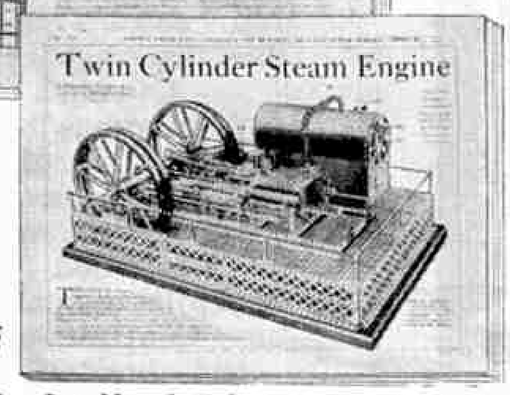
Leaflet No. 27

Leaflet No. 15

Leaflet No. 20

Leaflet No. 36

Leaflet No. 14



Leaflet No. 32

No. 1 MOTOR CHASSIS. This model runs perfectly under its own power. It has Ackermann Steering, Differential, Gear Box and Clutch, etc.

No. 2 SHIP COALER. All the movements of a real ship-coaler are reproduced in this model.

No. 3 MOTOR-CYCLE AND SIDE-CAR. The sidecar is of stream-line design and is mounted on springs. The motorcycle is complete with lamps, horn, exhaust pipes, etc.

No. 4 GIANT BLOCK-SETTING CRANE. This realistic model is fitted with an accurate reproduction of Fidler's block-setting gear.

No. 5 TRAVELLING BUCKET DREDGER. In this model trucks and wagons can run underneath the chute through which falls the material raised by the dredger buckets.

No. 6 STIFF-LEG DERRICK. This model has many interesting movements, including hoisting, luffing and swivelling, which are controlled by suitable levers.

No. 7 PLATFORM SCALES. This model will weigh articles up to 4½lb. with remarkable accuracy.

No. 8 ROUNDABOUT. This model is most attractive when in motion. As the roundabout rotates the cars spin round and the horses rise and fall.

No. 9 BAGATELLE TABLE. This is an interesting model that will give hours of fun to the players.

No. 10 LOG SAW. In this model the saw is driven rapidly to and fro while the work table travels beneath it.

No. 11 SINGLE-CYLINDER HORIZONTAL STEAM ENGINE. Fitted with balanced crankshaft, crosshead, and centrifugal governor.

No. 12 STONE SAWING MACHINE. The model is equipped with adjustable work table and overhead trolley with self-sustaining chain hoist.

No. 13 MECCANOGRAPH. This wonderful model will draw hundreds of beautiful designs.

No. 14 GRANDFATHER CLOCK. A practical example of Meccano model-building. The model keeps accurate time.

No. 15 BALTIC TANK LOCOMOTIVE. The driving wheels are operated by an Electric Motor. An accurate reproduction of Walschaerts' Valve Gear is fitted.

No. 16 LOOM. This is perhaps the greatest Meccano success. The model weaves beautiful material.

No. 17 PLANING MACHINE. Fitted with quick-return motion.

No. 18 REVOLVING CRANE. This model is fitted with screw-operated luffing gear.

No. 19 STEAM SHOVEL. This model embodies travelling, rotating, racking and digging movements, and jib hoisting and lowering gear.

No. 19a STEAM EXCAVATOR, OR MECHANICAL DIGGER. A Meccano Steam Engine is incorporated in this model and provides the power for operating the four movements.

No. 20 MOBILE CRANE. This model has hoisting, luffing, travelling and slewing movements. It is fitted with an automatic brake on the hoisting shaft, an internal expanding brake on the front axle, and a limit switch to prevent over-winding of the jib in either direction.

No. 21 TRANSPORTER BRIDGE. The carriage automatically travels to and fro for as long as the motor is driven, pausing for a few seconds at each end of its travel.

No. 22 TRACTION ENGINE. A remarkably realistic model that will pull a boy of average weight. Fitted with two speeds.

No. 23 VERTICAL LOG SAW. While the saws are in motion, the logs are fed slowly to them.

No. 24 TRAVELLING GANTRY CRANE. The movements of this model comprise the traversing of the entire gantry, hoisting and lowering, and the traversing of the crane trolley.

No. 25 HYDRAULIC CRANE. The hydraulic ram is represented realistically by a powerful screw mechanism.

No. 26 TWIN ELLIPTIC HARMONOGRAPH. Some beautiful designs may be produced with this model.

No. 27 DRAGLINE. This imposing model of a giant excavator is fitted with travelling, luffing, slewing, and dragging movements.

No. 28 PONTOON CRANE. The movements of this model include the operation of the two hoisting blocks, slewing of the entire crane, and luffing.

No. 29 HAMMERHEAD CRANE. This is a very realistic and powerful model, comprising traversing, hoisting and slewing motions.

No. 30 BREAKDOWN CRANE. This model is equipped with travelling, slewing, luffing, and hoisting motions, and also is fitted with laminated springs, brakes, out-riggers, etc.

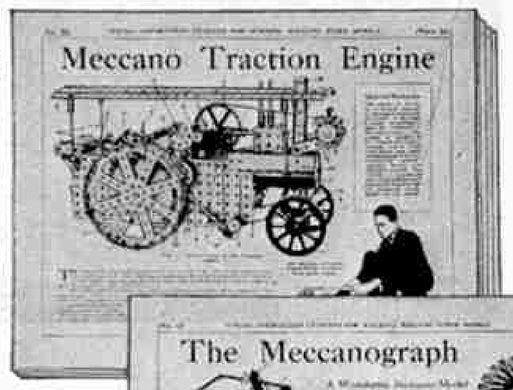
No. 31 WAREHOUSE WITH ELEVATORS. The two cages are driven automatically and work alternately, pausing at top and bottom positions.

No. 32 TWIN CYLINDER STEAM ENGINE AND BOILER. This is a realistic working model of a complete steam plant, equipped with valve gear, governor, balanced cranks, etc.

No. 33 SINGLE AND DOUBLE FLYBOATS. These two models represent popular pleasure-fair attractions.

No. 34 THREE-ENGINE BIPLANE. This is a realistic model of an "Argosy" machine, and is fitted with ailerons, elevators and rudders.

No. 36 ELECTRIC DERRICK CRANE (Scotch Type). This imposing model is built to a scale of ¾ in. to 1 ft., the jib measuring 6 ft. in length. The movements include hoisting and lowering, luffing and slewing.



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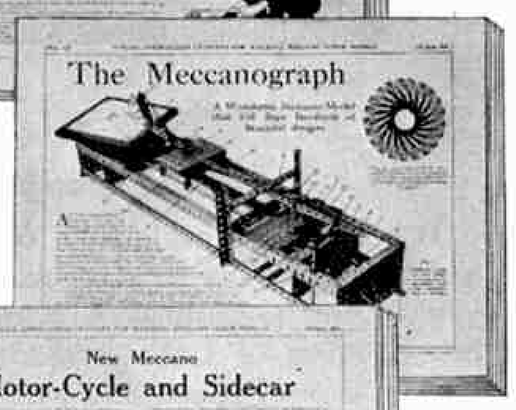

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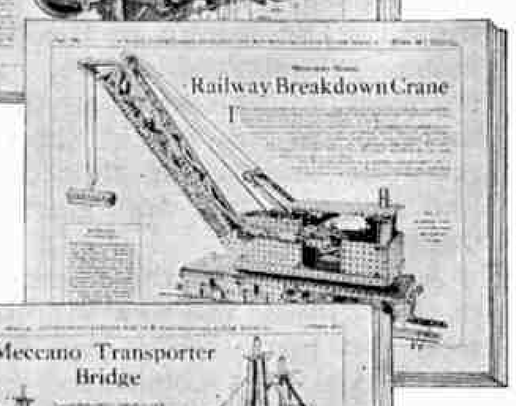

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Leaflet No. 19a

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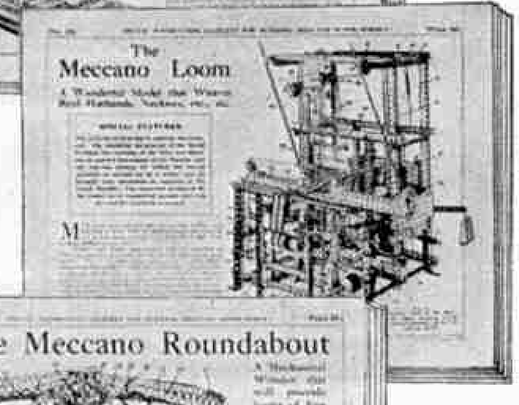

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The Angel of Rheims

The latest French "Sinking Fund" stamp bears a highly interesting and topical design in the form of a reproduction of the famous "Sourire de Reims" statue from the front of Rheims Cathedral. Although its base was so badly damaged that the statue was tilted forward to

overhang at a terrifying angle, it remained in position undamaged throughout the heavy bombardments suffered by the city during the European War.

The nominal value of the stamp is 1f.50, but it is sold at a premium of 3f.50, the proceeds of the premium being devoted to the reduction of France's debts to her Allies in the War.

Bahamas Pirates

In our recent Stamp Gossip note regarding the Bahamas Centenary stamp we missed a highly interesting point, to which our attention has been drawn subsequently by a reader's request for an explanation of the somewhat unusual motto appearing on the stamp. This is "*Piratis Expulsis, Restituta Commercia,*" the meaning of which is "When the pirates were disbanded, our trade revived."

At the beginning of the 18th century the seas surrounding the Bahamas swarmed with pirates, and in order to protect the colonists, the British Government of the day finally sent Captain Woods Rogers, a one-time privateer, to dislodge the buccaneers, presumably on the principle of "set a thief to catch a thief."

Captain Rogers made light work of his task, and within a short time of his arrival at Nassau, the capital of the Bahamas, he captured and executed a considerable number of the pirates and forced nearly 1,000 more to lay down their arms. So remarkable were the effects of his campaign that it was decided then and there to commemorate his work by adopting the motto quoted, and it has survived to this day.

Collectors' Purchases

A striking example of the enormous extent to which stamp collectors support new issues was seen on the occasion of the recent first issue from the Vatican City. The total face value of the stamps comprising this issue was approximately £750,000, and nearly two-thirds were sold to stamp collectors in the first three months of issue!

The Vatican City was thus half a million pounds to the good, for no postal service was rendered in return for the money thus received.

Russian Propaganda Issues

Few countries make so extensive a use of the propaganda value of their stamp designs as Soviet Russia, and among the more than 80 new varieties that have been issued during the past ten years there is scarcely one poor specimen. Among recent issues, the designs of the Industrial Loan propaganda stamps, sent out late last year, strike a decidedly new note. There were four stamps in the set, 5, 10, 20 and 28K. The lower values used a view showing a range of blast furnaces in full operation, and across the head of each was blazoned the slogan "More metal, more machines."

We illustrate the design used for higher values, because we believe it to be the first instance of the use of graphical methods on a postage stamp. The design shows a blast furnace, and, to the side, a graphic representation of the respective outputs of pig iron in the years 1913 and 1928, for comparison with the total aimed at for the year 1933.

Zeppelin Stamps

In connection with the recent trans-atlantic flight carried out by the German airship, "*Graf Zeppelin,*" the United States Government issued a special series of stamps for use on correspondence sent from the U.S.A. for delivery at Friedrichshafen or at the calling points on the westward trip. Three denominations, 65c., $1.30, and $2.60, were issued to a total value of $4,500,000. The value of

the stamps actually used was approximately only $70,000, the mail carried totalling 17,268 letters and 6,436 post cards! Of course, a considerable portion of the balance of the issue was purchased by collectors for inclusion in their collections.

Each of the special stamps was of the shape shown in our illustration of the $1.30 value, giving a view of the airship crossing the South Atlantic Ocean from Europe to America. The 65c. value shows "*Graf Zeppelin*" flying low over the ocean on its eastward journey, while on the $2.60 value it is shown superimposed on a globe. The wording and position of the inscriptions is the same on all three stamps, the value tablets only showing differences.

From a production standpoint the issue is one of the best efforts that the U.S.A. has ever produced. The collectors, who swallowed up the greater part of the issue, have at least the consolation of knowing that they have helped to advance the cause of aviation, for the Zeppelin Company took half the proceeds of the sale of the stamps.

For the benefit of such collectors the stamps remained on sale at the U.S. Government Philatelic Bureau until 30th June. They were withdrawn from local post offices immediately after the departure of the airship from Lakehurst, N.J., on its return flight.

Belgium's New Issues

Belgian new issues are well to the fore this month. They include two new values added to the permanent issues, a new air stamp series, and two commemoratives issued in connection with the centenary exhibitions at Antwerp and Liege.

The commemoratives are really splendid stamps, produced in photogravure, and deservedly rank amongst the best portrait issues. Both stamps are 35c. denominations, that issued for the Antwerp Exhibition showing Peter Paul Rubens, the great Belgian painter, and that for

Liege, Dr. Zenobi Gramme, the scientist, to whom fame attaches principally by reason of his work in the development of the dynamo, a representation of this machine being shown at the foot of the stamp. The stamps are coloured deep blue green and are perforated 12½×12.

The air mail series, also produced by photogravure, contains four values, on each of which a monoplane is shown flying over a Belgian city, the actual illustrations showing: on the 50c., Ostend and its beautiful beaches; on the 1f.50, St. Hubert in the Luxemburg province; on the 2f., Namur, on the beautiful River Meuse; and on the 5f., Brussels with the towers of its Law Courts dominating the middle distance.

Uruguayan Centenary

Uruguay, the smallest, but by no means the least important, of the South American Republics, is to celebrate the centenary of its independence on the 25th of this month. At the time of going to press, no definite information is available, but it is expected that commemorative stamps will be issued.

New Chinese Designs?

The introduction of a new design for Chinese stamps, in the very near future, was foreshadowed in the recent announcement that an order for the printing of 2,500 million postage stamps for the Chinese Government has been given to the London firm of Messrs. Thomas de la Rue & Company. In discussing the order, a representative of the firm said that this is the largest stamp printing order ever given to a single firm in this country. The value of the contract amounts to £100,000 and will provide work for several years for a large number of people.

Details of the new design are not yet available for publication.

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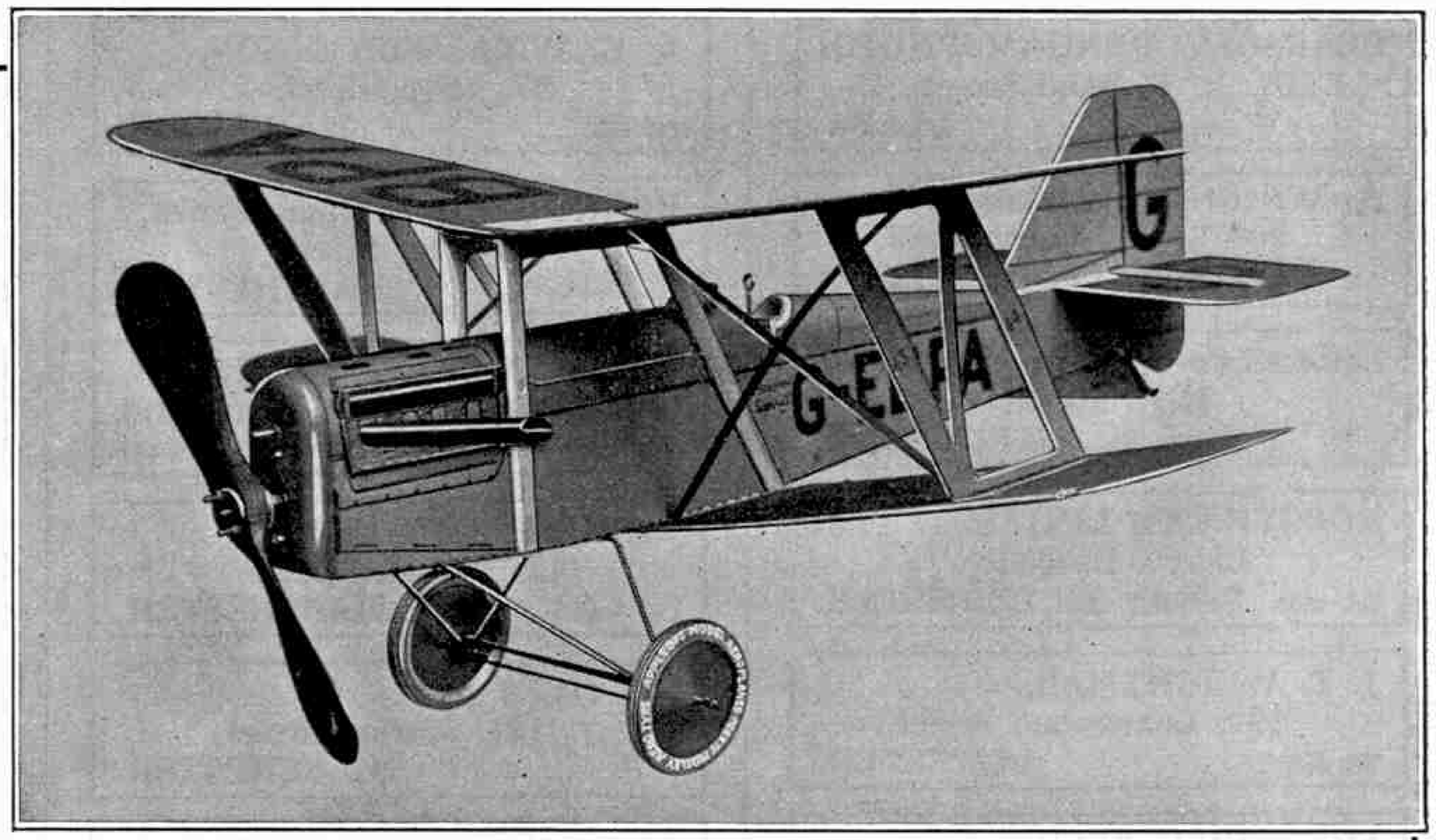

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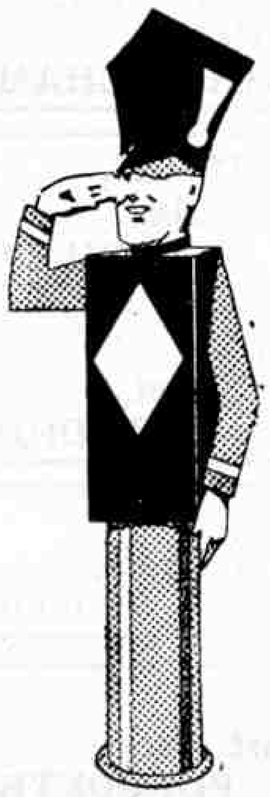

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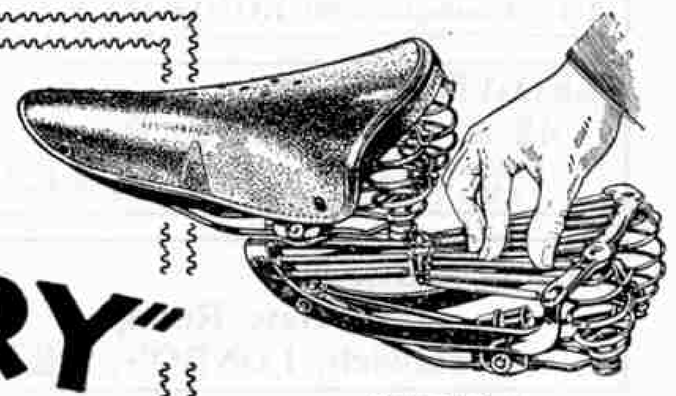

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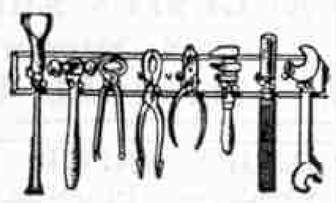

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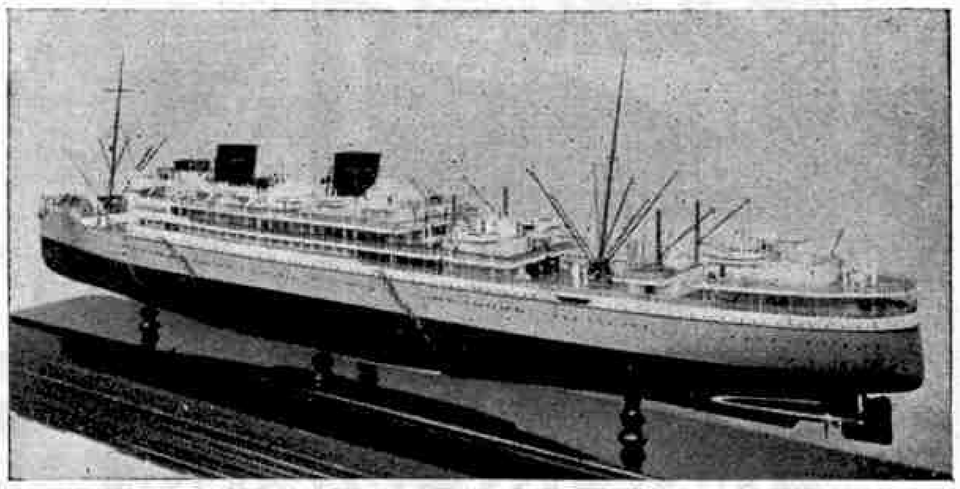

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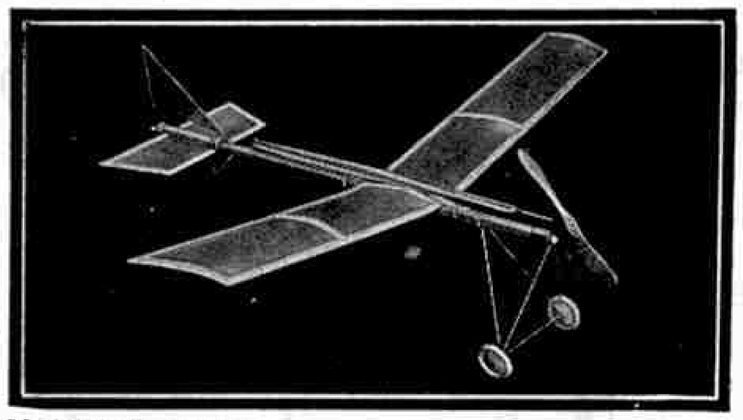

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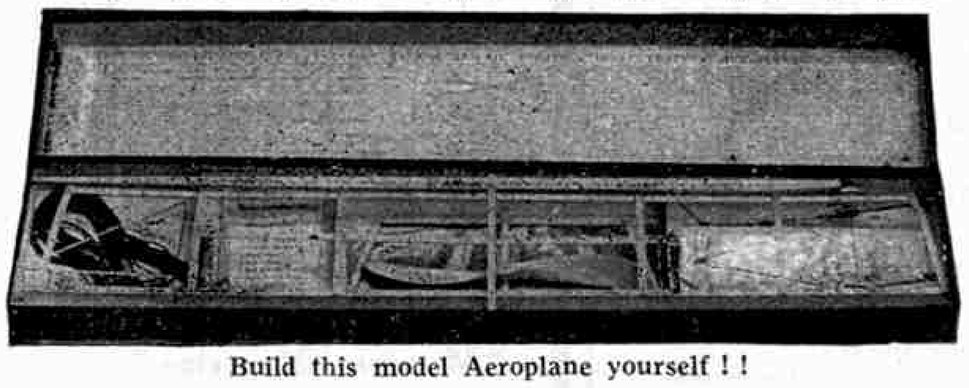

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Hand-Carved Propeller. Birch Planes.
Best Proofed Silk. Best Quality Rubber.
Patent Landing Chassis. Working Drawings and Instructions, etc.

The Ideal CONSTRUCTIONAL SET for the Model Enthusiast.

Price 12/6. Postage 6d.

Ask your local dealer to get you one, or post your P.O. direct to :—

PATENT MODEL MANUFACTURERS,
159, Lymington Avenue, Wood Green, London, N.22.
'Phone : Tottenham 3278.

The 1930 Jaeger Meccano Jersey.

JAEGER
Pure Wool

JERSEYS & SUITS
MADE SPECIALLY FOR MECCANO BOYS

The popularity of these useful Jaeger Jerseys and Jersey Suits increases each year. They are made in a variety of suitable plain colourings and marl mixtures. The new design for 1930 is a prominent dice pattern, formed with a contrast shade on the collar, cuffs and base of Jersey.
It makes a splendid outfit for the real boy.

Jersey No. BJ203. Chest 22 in., 7/–, rising 9d. every 2 in. to size 30 in.
Jersey Suit No. 404. Chest 20 in., 13/–, rising 1/– every 2 in. to size 26 in.
¾ Hose. Turnover Tops to match, 3/3 for size 4, to 4/3 for size 12.

Colours—Navy, Steel Grey, Fawn, Brown, Brown Mixture, Fawn Mixture, Saxe Mixture,
with neat dice effect on Collars, Cuffs, and at base of Jersey.

Obtainable only from Jaeger Branches and Agents.
(Write for the address of your Local Agent).

HEAD RETAIL BRANCH: JAEGER HOUSE, 352/54, OXFORD ST., LONDON, W.1.
WHOLESALE & SHIPPING : 95, MILTON ST., LONDON, E.C.2.

AUSTRALIA—Melbourne, 234/236, Flinders Lane, Sydney, 38/44, York Street.
CANADA—Montreal, 1187 Bleury Street.

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*LONDON:
318, High Holborn, W.C.1;
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Everything needed by those who play games or indulge in athletic pastimes of any description can be obtained. But, not only can goods be bought, but expert advice on everything relative to sport is at your disposal without the slightest obligation.

Call if you can but write if you can't for Illustrated Catalogue to any of these addresses, mentioning the "Meccano Magazine."

**A full range of Meccano at these Branches.*

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133 *Spalding Agents all over the World.*

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THE NIFTIEST THING for SIGNALLING
FLASH! FLASH! GOES THE "BAT" BATTERY PISTOL
PRICE 1/-
6½d WITHOUT BATTERY or BULB POST FREE 9d
COMPLETE WITH BATTERY & BULB POST FREE 1/3

A real live Flash Pistol, complete with bulb and battery, for 1/3 (Post Free).
The nifty toy for every boy. Scouts simply can't do without one. Dot—Dot—Dash goes the "Bat," flashing out a clear message, or you can keep the brilliant light focussed on any object continuously. Send NOW for your "Bat!"

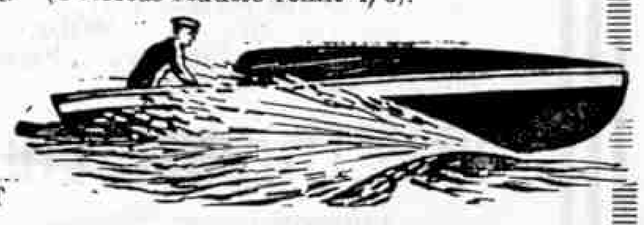
BOYS! SHOOT! With a Blazing Flash!
The "BAT" cannot do any harm.

ABBEY·TOC-TOC-NINE
THE BOAT for the BATH
COSTS LESS THAN EVER
NOW 2/11

Here's a snip BOYS!
INSTANT ACCELERATION
THE BIG NOISE IN SPORTY TOYS

HOT AIR DRIVE from "Meta," Spirit, or Candle-end. *No clockwork; no battery; no boiler!* NOTHING TO EXPLODE! . . . 9 ins. long. Draught 2 ins. . . . "TOC-TOC," the GENUINE and ORIGINAL, costs a little more than imitations, but is *worth MUCH more.* ASK YOUR FRIENDS who have "TOC-TOCS"—they *know!*

If your Toy Dealer is sold out, send his name and address, with P.O. 3/5, when we will supply post paid. (Overseas readers remit 4/6).



RUNS 15 MINUTES WITHOUT ATTENTION.

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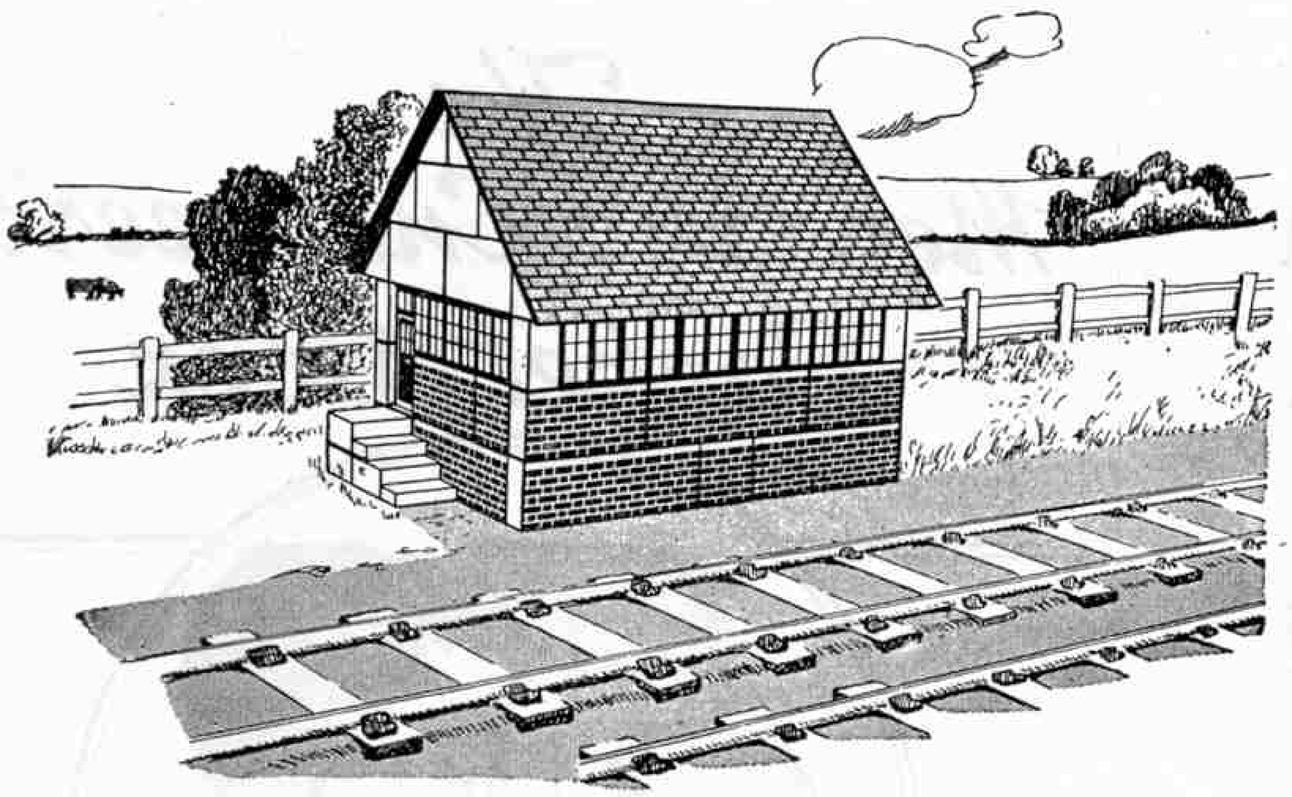


Boys! Build This Signal Box

FOR YOURSELF WITH

LOTT'S BRICKS

LODOMO

The New Stone Building Bricks

Each Box is complete with Bricks, Roofs, and Plans in Colours for the number of models stated.

Box 1 18 models 3/6 **Box 2** 50 models 7/6

Box 3 72 models 12/6

Send to-day for your FREE copy of the latest book of Lott's Bricks, beautifully illustrated in full colours. It tells all about the many wonderful buildings you can make with these stone bricks.

The Signal Box shown above is built with No. 3 Lodomo and is one of the 72 models from this box. This number includes Goods Sheds, Railway Stations, Farm Buildings, Market Hall, Country House, Wayside Inn, Petrol Filling Station, etc., etc., all in bright realistic colours.

POST THIS TO-DAY

To LOTT'S BRICKS LTD., WATFORD, HERTS.

Please send me FREE Copy of your Booklet as advertised in the "Meccano Magazine."

NAME.....

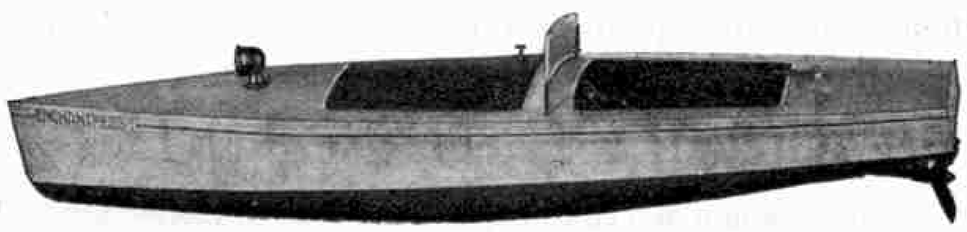
ADDRESS.....

.....

Enclose in unsealed envelope, ½d. stamp.

Here's a Clockwork Motor Boat that every boy will want—

The "ENCHANTRESS"

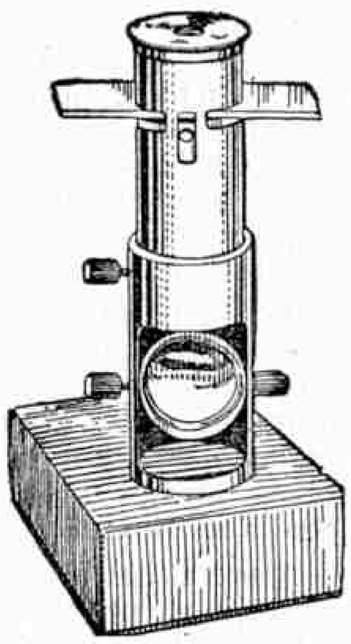


Built up hull, powerful clockwork motor giving five minutes' run at one winding, two-bladed propeller, adjustable rudder, windscreen, ventilator and pennant. Hull finished white and green with red lines and name in gold letters.
Length 21 ins. Beam 3⅞ ins. Price **18/6**

also Electric Model

Length 24 ins. Beam 4½ ins. Price **25/-**

Both models obtainable only from Hamleys



New Scholar's Microscope

An efficient yet inexpensive instrument, magnifying 50 times. Adjustable mirror and eyepiece. Supplied complete with one object slide, one plain slide, one slide with cavity for liquid, and one cover glass. Price (postage 6d.) **7/6**

Cheaper model without stand (postage 3d.) **3/6**

Hamleys
Estd 1760
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Branches: London, Croydon and Eastbourne

Mail Order Dept. (M),
200/2, REGENT STREET, LONDON, W.1.

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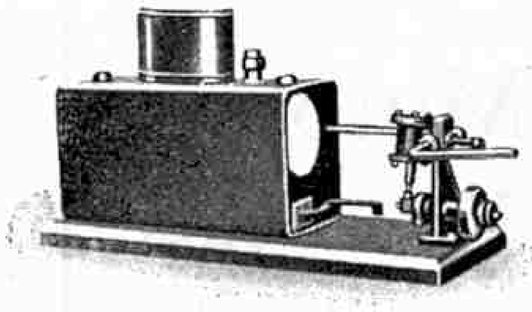
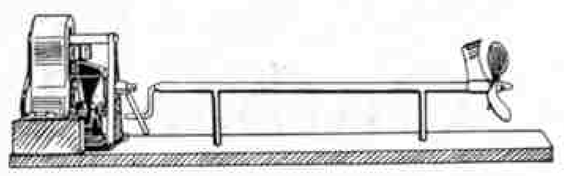
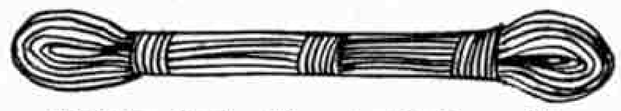


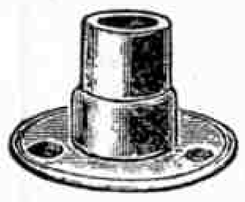
S.T. Engine & Boiler. Engine Parts, 5/-; Finished Boiler, 8/-; Finished Engine and Boiler, 13/-. Postage Free.



Electric Motor. Reversible, Self-starting. Price **7/6**. Propeller and Shaft to fit, **1/6**



Rigging Cord. Fine to Medium, **4½d.**



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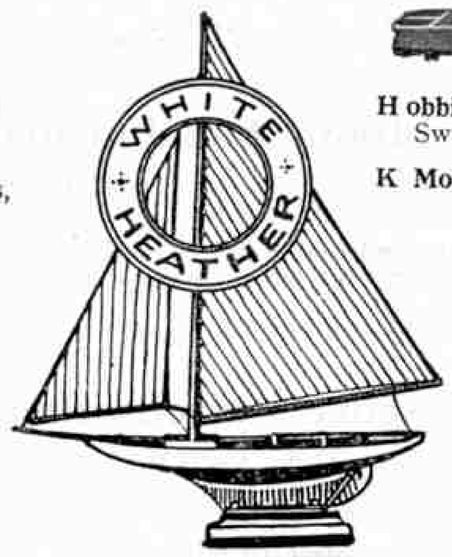
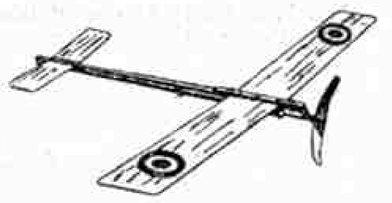
Hobbies Bowman Steam Boats. Swallow, **17/6**; Snipe, **22/6**

K Motor Boats. Clockwork, Steam and Electric.

Hand Winch. Price **9d.**



Special Racing Yacht. 21", Post Free, **22/6** All sizes from **7/6** to **£8/8/-**



Warneford Aeroplanes. Moth, **4/6**; Swift, **10/6**; Racer, **21/-**

Appleby's. to build up. **1/- 1/6 2/- 3/-**

Anchors. 3d. & 6d.

Postage extra on goods less than 5/- in value Price List Free.

Screw Eyes. Per doz., **3d.**

C. LUCAS, Hobbies Depot, 35, Manchester St., Liverpool.

ASK your people to give you a DAISY Air Rifle for the holidays. Here is a gift that will give you endless hours of jolly good fun and amusement, besides helping you to become a really good shot. Those tales you read—those yarns you hear of cowboys' wonderful shooting—snuffing a candle at fifty paces—a cigarette halved, at thirty! Doesn't that make **you** want to become a crack shot! With a DAISY Air Rifle—especially the magnificent Pump Action model—you have everything in your favour. Accurately made rifles—well balanced and easy to handle—the rest is up to you. There are DAISY Air Rifles from 4/6 up to 23/-. See and choose one at any good toy shop, sports outfitters or store. Write for free booklet illustrating all models.

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Made in U.S.A.

"EASTANGLE"
(regd.)

Outboard Motors
Motor-Boats & Kite-Boats

KITE SPEED-BOAT, painted wood, varnished deck, 17 ins. long. Sheers away from shore like a kite on a string, turns about when you turn. **In appearance and behaviour the nearest thing to real speed-boat** yet invented. (M1) ... ... Price **4**/-

KITE STEAMER, two funnels and masts, similar in action to above, 14 ins. (M2) ... ... Price **3**/-
Ditto, much superior, 15½ ins. (M3) ... ... Price **4**/-

ELASTIC-DRIVEN SPEED-BOAT (M4), **beautiful hollow-built model** with cockpit and wind-screen, very fast, 17 ins. long, with novel quick-winding gear, fully wound in ten seconds ... ... Price **7**/-

Outboard Motor Attachments

Fitted in one minute to any boat or piece of wood flat underneath or with straight wooden keel.

No. 1, fits any shape of boat, need not be flat, hand-driven through long flexible shaft, a fine gadget for races when paddling or bathing. (M5) Price **3**/-

No. 2, elastic-driven, very fast, with novel quick-winding gear, winding takes 10 seconds only (M6) ... ... Price **2**/-

Boats for above Attachments

Painted and varnished Speed-Boat, 17 ins. long (M7) ... Price **3/6**
Two-funnelled Steamer, 14 ins. (M8) ... ... Price **2**/-
Ditto 16 ins. (M9) ... ... Price **3**/-

All above prices are Post Free, in Great Britain. Postage abroad extra.

All above are obtainable at high-class toy-shops and stores, or direct from us. **Please mention numbers in brackets when ordering.**

If dissatisfied your money willingly refunded if goods returned undamaged within a week of receipt.

EAST ANGLIAN INVENTIONS CO.

PANTILES, PAKEFIELD, LOWESTOFT

The Meccano Engineer's Pocket Book

Build Models from your own drawings

Every Meccano boy, being an engineer himself, should adopt the habit of taking engineering notes and sketches of interest, for by doing so he is able to get a great deal more pleasure out of his hobby. The Meccano Engineer's Pocket Book is specially suitable for this purpose. It enables a boy to make drawings of any engineering structures —Cranes, Bridges, Steam Shovels or Locomotives— that he may see on his travels and then, when he gets home, he can reproduce these structures in Meccano, guided by the drawings he has made.

Difficult to memorise details

Supposing a Meccano boy is on a tour of inspection of some interesting docks, and that a cleverly designed crane catches his eye. If he does not carry a note book he tries to memorise the most important features of this crane, with a view to constructing a model of it upon his return home. In the majority of cases the memorising of engineering features in this manner leads to failure when the time comes for building them in Meccano. It is fairly easy to build a model that will perform similar functions to its prototype, but it is a very difficult matter indeed to reproduce from memory individual mechanical details.

When faced with a problem of this kind, a real engineer would immediately take out his pocket book and set to work to sketch in it all the details that he would require in order to prepare later a practical working drawing. Meccano boys are in a position to do likewise if they always make a point of carrying one of the "Meccano Engineer's Pocket Books."

The Pocket Book costs 1/-, post free, and will be sent on receipt of this amount in stamps. Write to Dept. 73, Meccano Limited, Old Swan, Liverpool.

MECCANO LTD.

OLD SWAN ——— LIVERPOOL

Every Meccano Boy in the world, and there must be millions of them, knows and can tell you what are the values and uses of

SECCOTINE

Reg. Trade Mark.

IT IS MAKING & MENDING DAILY, all over the world

Every house should have a tube of Seccotine.

Every Shopkeeper should be ready to supply on demand. Tubes 4½d., 6d., 9d.

Seccotine mends big breakages and small breakages.

McCAW, STEVENSON & ORR Ltd., The Linenhall Works, BELFAST.

If you cannot lay your hands on a Meccano boy, then write to the works (address as above) for a FREE booklet. It will surprise you. A minute quantity of Seccotine will put the spring back into silk garments, laces and fine table linens—and there is no heating or mixing with other material required.

BOYS & GIRLS

Have your own tubes, and learn what wonders you can do with this famous material. When you have done anything very smart, write to us at the works (address as above).

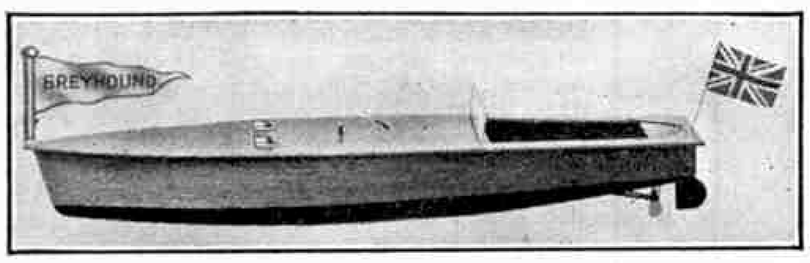
If you want Speed—be sure your Motor Boat is a

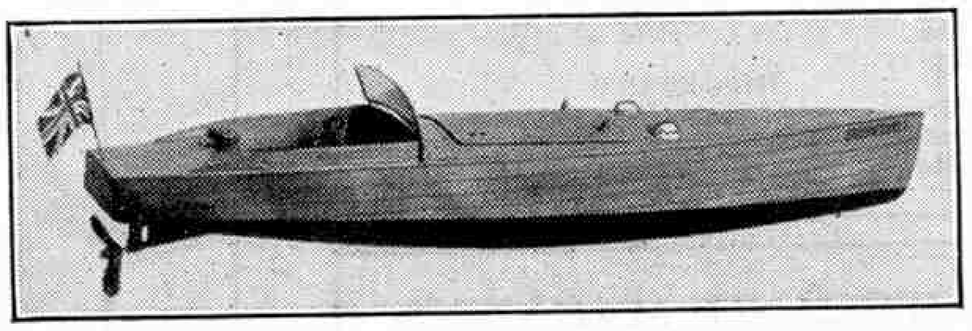
"GREYHOUND"

CLOCKWORK *or* ELECTRIC

Natural Mahogany Finish, Powerful Motors, Brake Control, Two-Blade Brass Propeller, One-Piece Wind and Spray Screen

WELL BUILT





CLOCKWORK

Greyhound VI.	12¼″	Retails	4/6
„ VII.	16¼″	„	7/6
„ VIII.	20½″	„	10/6
Super Greyhound V.	21″	Retails	17/6
„ „ IV.	25″	„	22/6

ELECTRIC

Greyhound III. 25″ for one Pocket Battery. Retails 25/6

Greyhound I. 25″ { 2 Pocket Batteries / 2-Speed } 35/-

A. J. HOLLADAY & CO. LTD., 3, Aldermanbury Avenue, LONDON, E.C.

Stocked by all leading Stores and Dealers: If unable to procure, write us!

How to obtain the "*M.M.*"

The "*M.M.*" may be ordered from all Meccano dealers, or from any newsagent or bookstall, price 6d. per copy. If desired it will be sent direct, post free, for 4/- for six, or 8/- for twelve issues. As a rule back numbers cannot be supplied, because only sufficient copies are printed to fill standing orders. To prevent disappointment, therefore, place a regular order with your dealer, newsagent, or the publishers—

"Meccano Magazine," Binns Road, Old Swan, Liverpool.

COMPLETE YOUR FILES

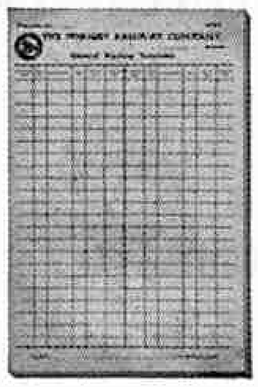
All "Meccano Magazines" prior to December, 1923, are out of print. Each of the 1924 issues, with the exception of January, February and September is in stock. Only the June, July, October and November, 1925, issues are available. All the 1926, 1927, 1928, 1929 and 1930 issues are in stock, with the exception of January, February, April and May, 1926, January, March, July and August, 1927, January and February, 1928.

Copies of back issues will be sent, post free, price 3d. for issues prior to 1925, 4d. for the issues of 1925 and 1926, with the exception of the December numbers. The December issues, 1925 and 1926, and all the issues of 1927, 1928, 1929, and 1930 are 8d. each.

Quotations for complete bound volumes may be obtained from the publishers—

"Meccano Magazine," Binns Road, Old Swan, Liverpool.

Hornby Railway Company Forms



Perfect miniature reproductions of the forms used in actual Railway practice are available to members of the Hornby Railway Company.

Pads of the following, each containing 50 forms, may be obtained from Headquarters, price 5d. each, post free. Each type of pad is supplied in a distinctive tint.

G.W.1. General Working Timetables.
S.D.4. Stationmaster's Arrivals and Departures.
E.J.5. Engineman's Job Cards.
S.B.6. Signal Box Instructions.
S.R.7. Stationmaster's Report Forms.

The price of the complete set of five pads is 1/9 post free.

IMPORTANT.

Please quote membership number when ordering supplies.

Headquarters: Hornby Railway Company, Old Swan, Liverpool.

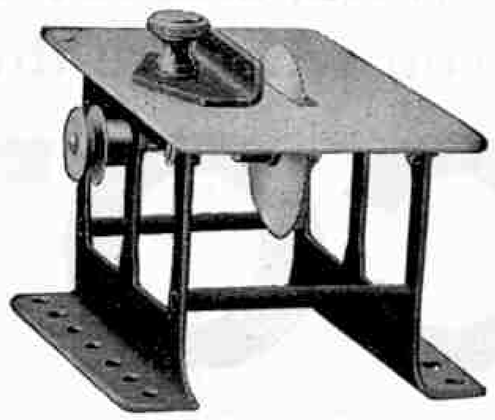
"MECCANO MAGAZINE" SPRING BACK BINDER

There is no better way of keeping your Magazines clean and tidy than by binding them in one of the special binders we supply.

These binders have strong stiff backs, covered with black imitation leather, tastefully tooled, and are lettered in gold. The large binder holds 12 Magazines—price 4/6 post free. The small binder holds 6 Magazines — price 3/- post free.

Meccano Ltd., Old Swan, Liverpool.

MECCANO SAW BENCH



This model Saw Bench is suitable for use with an Electric or Clockwork Motor or Steam Engine. By means of the equidistant holes in the base it may be built into a Meccano Model Workshop. Beautifully finished in black enamel and nickel. Price 4/-.

Meccano Ltd., Binns Road, Old Swan, Liverpool.

BINDING THE "*M.M.*"

Binding cases for back numbers of the Magazine may be obtained from Messrs. O. H. Bateman and Co., 23, Hanover Street, Liverpool. These are supplied in two sizes (1) for six copies price 3/6 and (2) for twelve copies price 5/3, post free in each case. The binding cases are supplied in what is known as "Quarter Basil, full cloth"—that is to say three-quarters of the sides are dark crimson cloth and the back and a quarter of the sides are dark crimson leather as shown here. The case is tastefully embossed in gold with the name "Meccano Magazine," and on the back is the name and volume number.

Binding 6 or 12 copies. These binding cases are supplied so that readers may have their Magazines bound locally, but where desired, the firm mentioned above will bind Meccano Magazines at a charge of 6/6 for six issues or 8/6 for twelve issues, including the cost of the binding and also return carriage. The covers of the Magazines may be included or omitted as required, but in the absence of any instructions to the contrary they will be included.

Whilst the binding of the twelve Magazines is quite satisfactory, they form a rather bulky volume and for that reason arrangements have been made to bind six months' Magazines where so desired, as explained above. Back numbers for any volume can be bound and the case will be embossed with the volume number.

WRITING PADS FOR MECCANO BOYS

These Writing Pads are becoming increasingly popular and most of the letters we receive from Meccano boys are written on the familiar tinted paper. The pads are supplied in two sizes, each consisting of 50 sheets of tinted bank paper, with cover. They are just the thing to use when writing to your friends, for the special notepaper shows that you are a Meccano boy.

Prices—Large, 1/- each (post free); Small, 6d. each (post free).

Meccano Ltd., Binns Road, Old Swan, Liverpool.

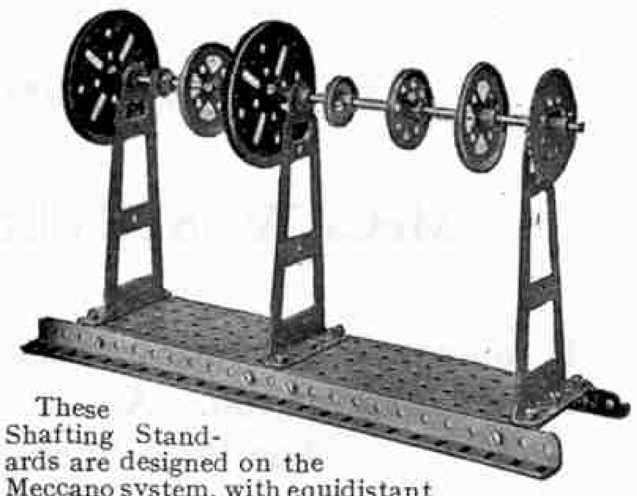
MECCANO ENAMEL

Meccano enamel has been introduced to enable model-builders to convert nickel parts to colour or to touch up coloured parts should such treatment become necessary through mishandling. It is available in red, grey or green, each colour being identical in shade with the enamels used in the Meccano Factory for spraying Meccano parts.

Price per tin 8d.

Meccano Ltd., Binns Road, Old Swan, Liverpool.

MECCANO SHAFTING STANDARDS



These Shafting Standards are designed on the Meccano system, with equidistant holes. Our illustration shows how strong and serviceable shafting may be constructed from Meccano parts with the aid of the Large Standard.

Standard only, Large... ... ... Price 1/-
" " Small ... ... " 8d.

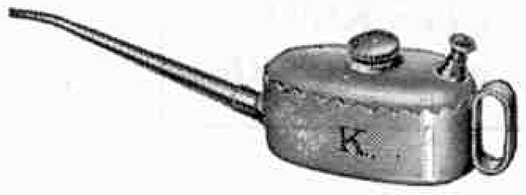
Meccano Ltd., Binns Road, Old Swan, Liverpool.

OIL CAN No. 1 (Ordinary Type)

This miniature Oil Can will give every satisfaction. It may be used for general purposes but it is particularly suitable for oiling Meccano Models and Hornby Trains. Price 6d.

Meccano Ltd., Binns Road, Old Swan, Liverpool.

OIL CAN No. 2 ("K" Type)



Every Meccano and Hornby Train enthusiast should add a miniature "K" type oil can to his equipment for the purpose of oiling Meccano models, Hornby Trains, etc. The oil is ejected drop by drop by depressing the valve, as in the full-sized model, and in all other respects the oiler is perfect.

One of the oil cans was sent to H.R.H. the Prince of Wales, and a gracious letter of acknowledgment was received expressing H.R.H.'s admiration of the beautiful lines and perfect finish of this model. Price 3/6.

Meccano Ltd., Binns Road, Old Swan, Liverpool.

MECCANO LUBRICATING OIL

Before commencing to operate a Meccano model, or to run a Hornby Train, all gears and bearings should be oiled thoroughly with Meccano Lubricating Oil. This oil is specially prepared and is of the right consistency for the purpose. Price per bottle 6d.

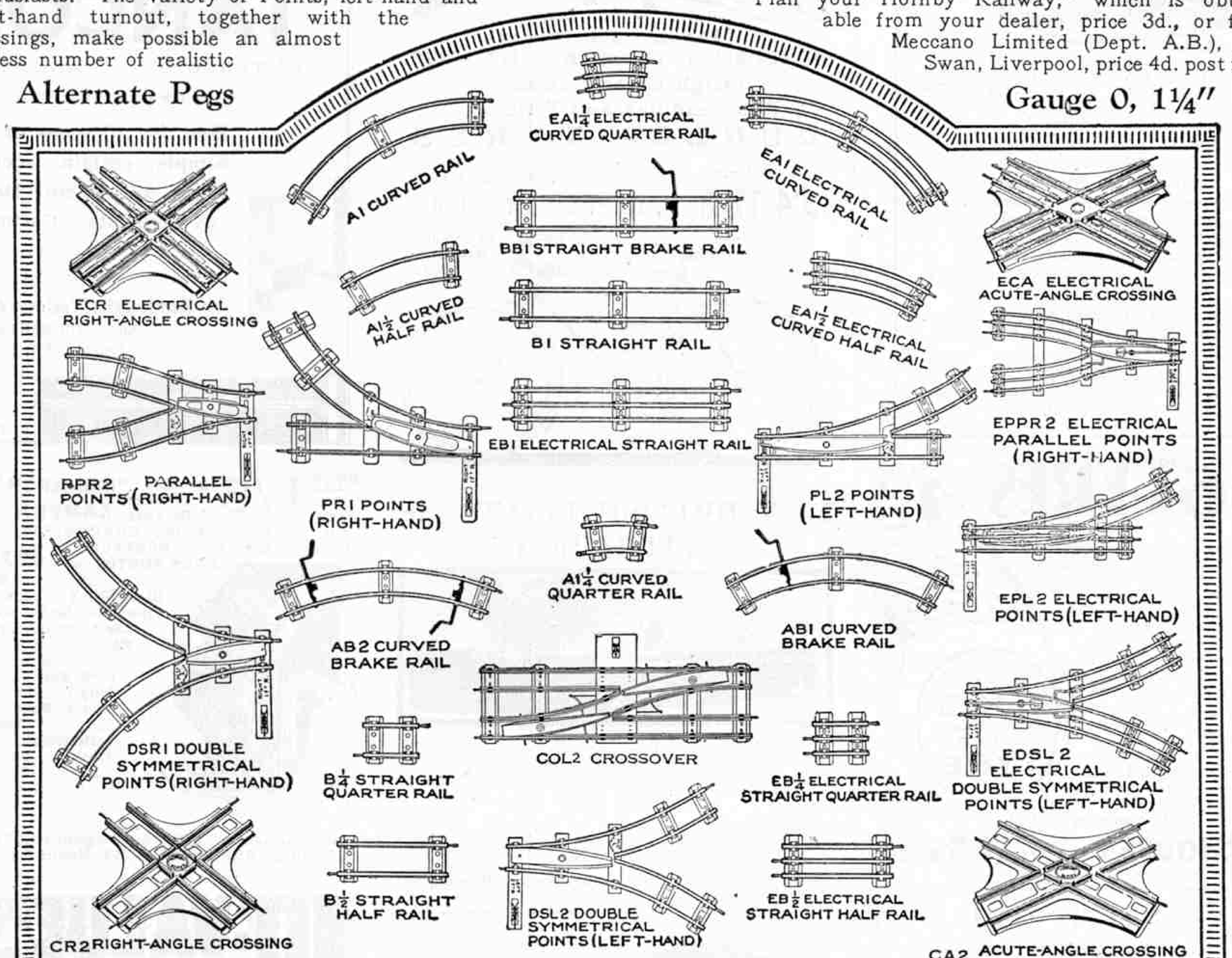
Meccano Ltd., Binns Road, Old Swan, Liverpool.

Hornby Series -:- Rails, Points and Crossings -:- Hornby Series

Hornby Rails, Points and Crossings are designed to meet the most exacting requirements of model railway enthusiasts. The variety of Points, left-hand and right-hand turnout, together with the Crossings, make possible an almost endless number of realistic and railway-like layouts. The adaptability of the Rails, Points and Crossings is well shown in a special booklet "How to Plan your Hornby Railway," which is obtainable from your dealer, price 3d., or from Meccano Limited (Dept. A.B.), Old Swan, Liverpool, price 4d. post free.

Alternate Pegs

Gauge 0, 1¼"



The addition of straight and curved brake rails supplied for Clockwork Trains makes possible a great deal more fun. By the use of the straight brake rail, trains may be brought to a standstill at the station platform in a very realistic manner.

Rails for Clockwork and Steam Trains

CURVED RAILS

1-ft. radius

A1	Curved rails	... per doz.	4/6
A½	Curved half rails	„	3/6
A¼	Curved quarter rails	„	3/–
AB1	Curved brake rails	each	6d.

2-ft. radius

A2	Curved rails	... per doz.	4/6
A2½	Curved half rails	„	3/6
A2¼	Curved quarter rail	„	3/–
AB2	Curved brake rails	each	6d.
DC2	Curved rails, double track ...	½ doz.	7/6

DOUBLE SYMMETRICAL POINTS

For 1-ft. radius curves

DSR1	Double symmetrical points, right	per pair	5/–
DSL1	Double symmetrical points, left		

For 2-ft. radius curves

DSR2	Double symmetrical points, right	per pair	5/–
DSL2	Double symmetrical points, left		

PARALLEL POINTS

PPR2	Parallel points, right	... per pair	5/–
PPL2	Parallel points, left		

CROSSINGS AND CROSSOVERS

CA1	Acute-angle crossings (for 1-ft. radius tracks)	each	2/–
CA2	Acute-angle crossings (for 2-ft. radius tracks)	„	1/9
CR1	Right-angle crossings (for 1-ft. radius tracks)	„	2/–
CR2	Right-angle crossings (for 2-ft. radius tracks)	„	1/9
COR2	Crossovers, right hand	per pair	12/–
COL2	Crossovers, left hand ...		

POINTS

For 1-ft. radius curves

PR1	Right-hand points	... per pair	4/–
PL1	Left-hand points		

For 2-ft. radius curves

PR2	Right-hand points	... per pair	4/–
PL2	Left-hand points		
PSR2	Points on solid base with ground disc and lamp, and adapted for Hornby Control, right ...	per pair	8/6
PSL2	Points on solid base with ground disc and lamp, and adapted for Hornby Control, left ...		

STRAIGHT RAILS

B1	Straight rails	... per doz.	4/–
B½	Straight half rails	„	3/–
B¼	Straight quarter rails	„	2/6
BB1	Straight brake rails	each	5d.
BBR1	Straight brake and reverse rails	„	1/6
DS1	Straight rails, double track ...	½ doz.	6/6
RCP	Rail connecting plates ...	„	4d.

Rails for Electric Trains

STRAIGHT RAILS

EB1	Straight rails	... per doz.	6/–
EB½	Straight half rails	„	4/6
EB¼	Straight quarter rails	„	4/–
EDS1	Straight rails, double track ...	½ doz.	8/6

CURVED RAILS

1-ft. radius

EA1	Curved rails	... per doz.	6/6
EA1½	Curved half rails	„	4/6
EA1¼	Curved quarter rails	„	4/–

2-ft. radius

EA2	Curved rails	... per doz.	6/6
EA2½	Curved half rails	„	4/6
EA2¼	Curved quarter rails	„	4/–
EDC2	Curved rails, double track ...	½ doz.	9/–

CROSSINGS

ECA	Acute-angle crossings ...	each	4/–
ECR	Right-angle crossings	„	4/–

POINTS

For 2-ft. radius curves

EPR2	Right-hand points	... per pair	7/6
EPL2	Left-hand points		

DOUBLE SYMMETRICAL POINTS

For 2-ft. radius curves

EDSR2	Double symmetrical points, right	per pair	8/6
EDSL2	Double symmetrical points, left		

PARALLEL POINTS

EPPR2	Parallel points, right	... per pair	8/6
EPPL2	Parallel points, left		
TCPL	Terminal connecting plates (low voltage)	each	1/6

Electrical Points for 1-ft. radius curves are not supplied

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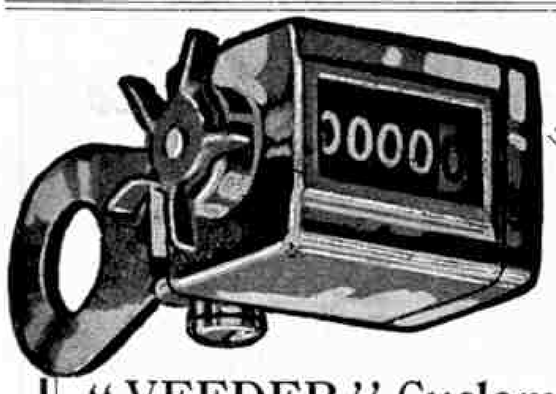

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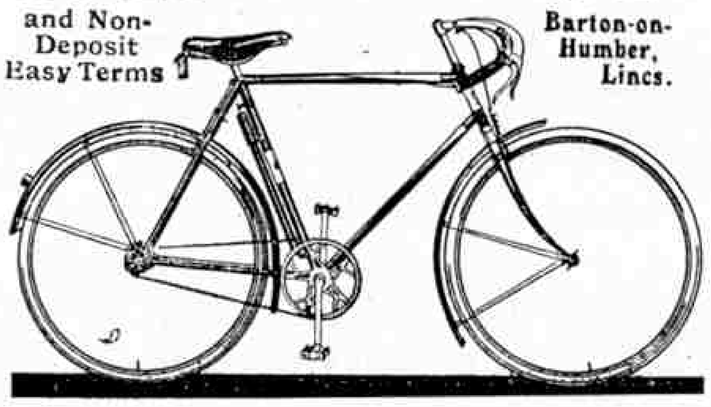
Barton-on-Humber, Lincs.



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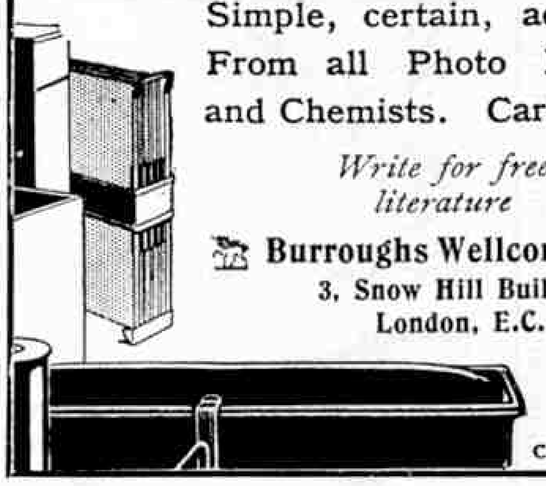

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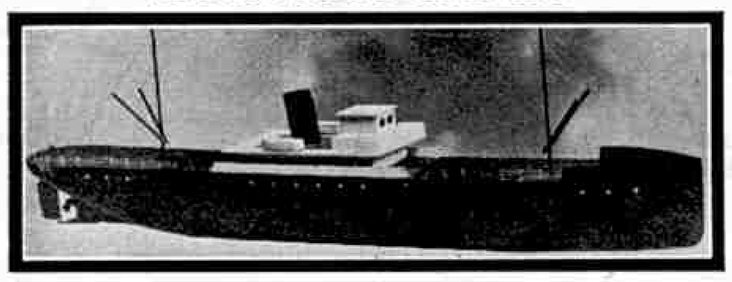

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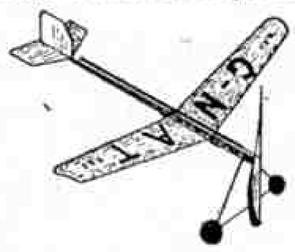

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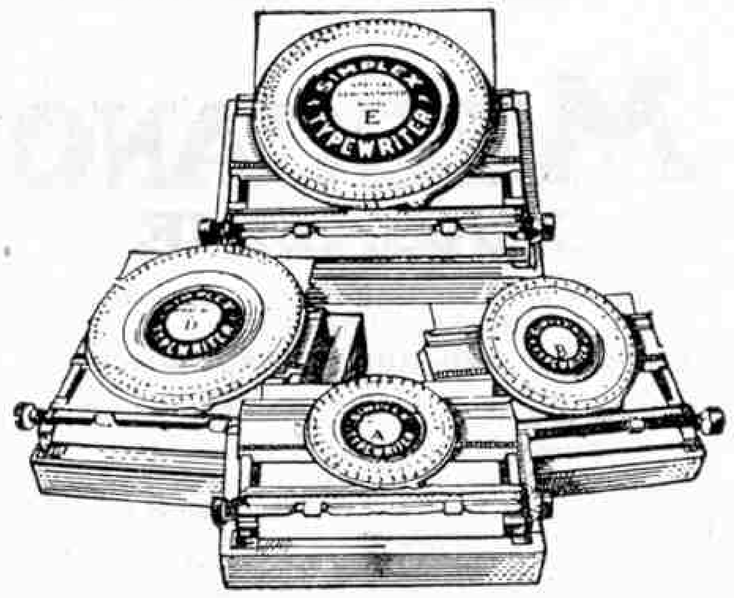

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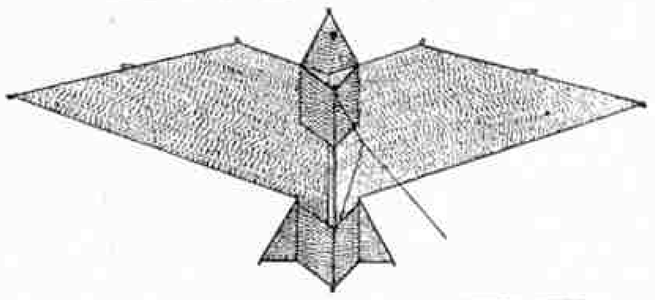

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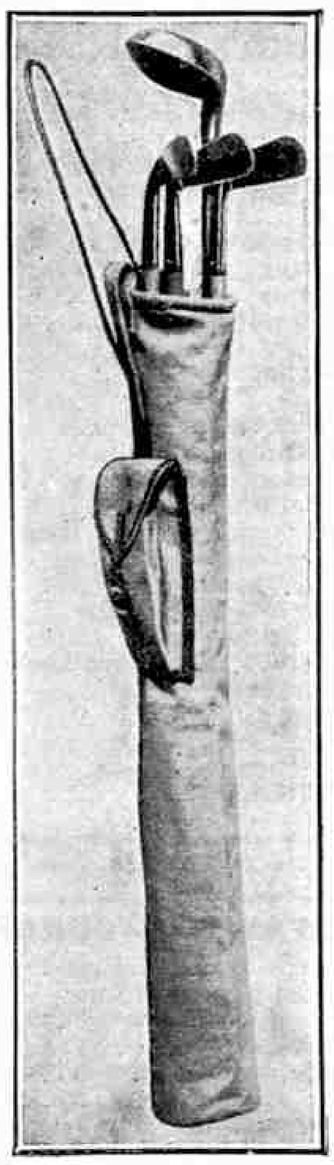

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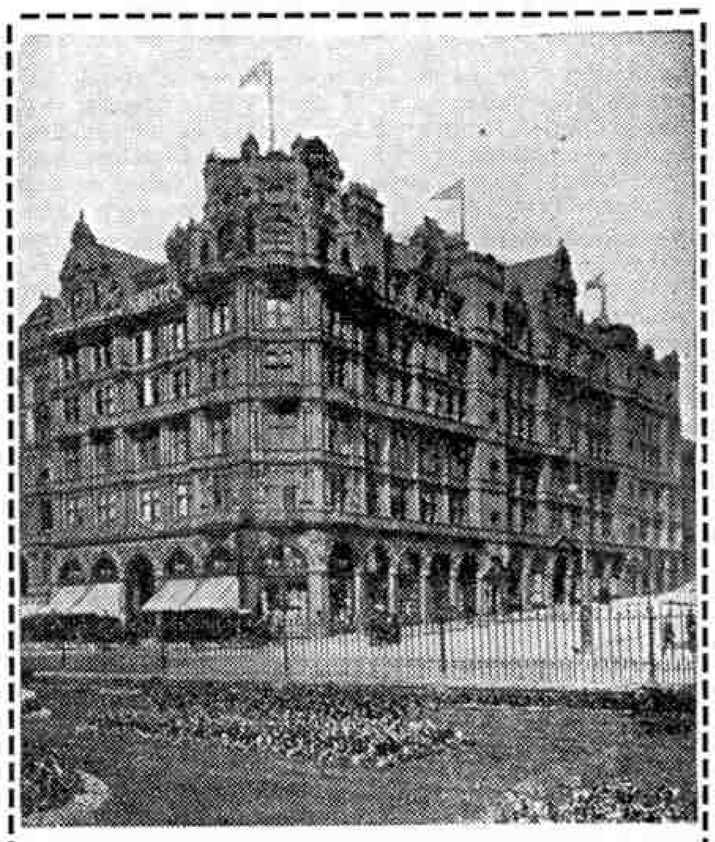

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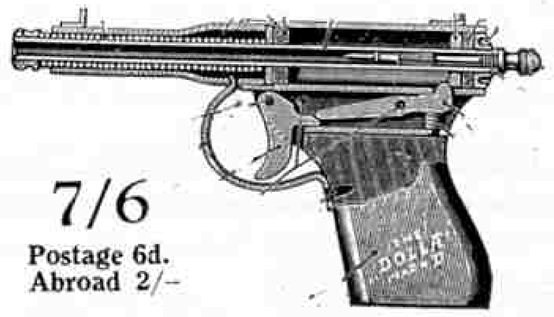

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STAMP ADVERTISEMENTS

(*Continued from page 656*)

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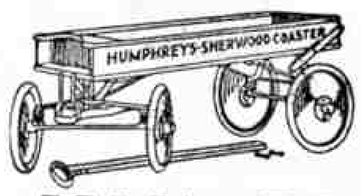

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What Shall I Be?—(*Continued from page 611*)

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No student of metal mining engineering should fail to join one of the grades of membership of the Institution of Mining and Metallurgy. This organisation works in close co-operation with the Institution of Mining Engineers, which was referred to in last month's article on colliery engineering. These institutions do not hold examinations, but full membership is available to mining engineers who have had a thorough training and have acquired experience in responsible posts. In addition, students and members are given facilities to keep in touch with the latest advance in mining science and engineering. Those who intend to adopt a mining career may obtain full particulars of the institutions from the Secretary, Institution of Mining and Metallurgy, Cleveland House, City Road, London, E.C.1.

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To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

Readers' Sales and Wants. Private advertisements (i.e., not trade) are charged 1d. per word, minimum 1/-. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Advertisers are asked to note that private advertisements of goods manufactured by Meccano Limited cannot be accepted.

Small Advertisements. 1/6 per line (average seven words to the line), or 16/- per inch (average 12 lines to the inch). Cash with order.

Display. Quotations for space bookings, and latest net sale figures, will be sent on request.

Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 8d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

Ordering the "M.M." Overseas

Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/5 per copy (postage extra), and the subscription rates 9/6 for six months and 19/- for 12 months (post free); Canada, where the price is 15c. per copy, and the subscription rates 75c. for six months, and $1.50 for 12 months (post free).

The U.S.A. price is 15c. per copy, and the subscription rates $1 and $2 for 6 and 12 months respectively (post free).

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the home market. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

CANADA: Meccano Ltd., 34, St. Patrick St., Toronto.
UNITED STATES: Meccano Co. of America Inc., New Haven, Conn. Meccano Co. of America Inc., 200, Fifth Av., New York.
AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.
NEW ZEALAND: Models Ltd., Kingston & Federal Streets, Auckland.
SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.
INDIA: Karachi: Bombay Sports Depot, Elphinstone Street, Bombay; Bombay Sports Depot, Dhobi Talao. Calcutta: Bombay Sports Depot, 13/C, Old Court House Street.

The Editor wishes to make known the fact that it is not necessary for any reader to pay more than the published price. Anyone who is being overcharged should lodge a complaint with the Meccano agent in his country or write direct to the Editor.

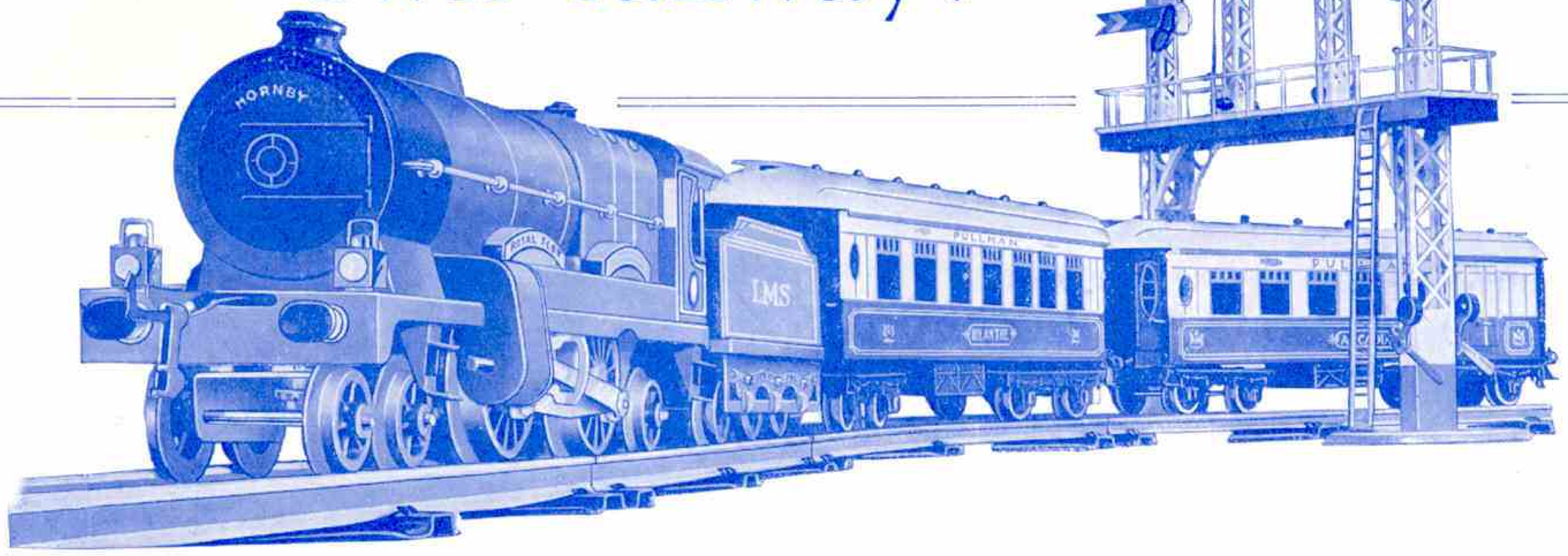
MECCANO EARPHONES

Meccano Earphones are British made and are of the highest quality procurable. They give loud, clear and undistorted reception and will add greatly to the efficiency of any wireless set. 4,000 ohms resistance.

Reduced Price 3/- per pair, post free.

Meccano Ltd., Old Swan, Liverpool.

Boys, run your own railway!



When you have a Hornby Train, with Hornby Rolling Stock and Accessories, you can enjoy the splendid fun of running your own complete railway system. It's the finest fun in the world, and so fascinating that even Dad will want to take part in the operations when you have fixed up and completed your railway system!

See how long a Hornby Locomotive runs without re-winding. See how it gets up speed with a heavy load behind it, and how smoothly it rides over Points and Crossings. And how fine and sturdily-built are Hornby Trains. How real they look. How beautifully they are enamelled in the correct railway colours. Every part of a Hornby railway is like that—strong and beautifully finished. Ask your dealer to show you samples.

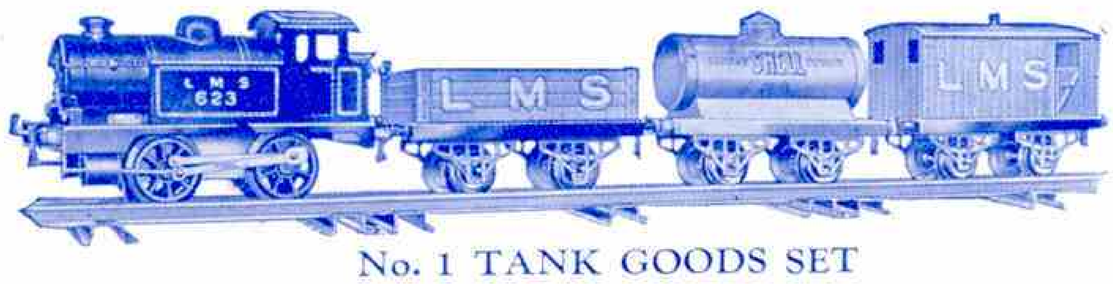
PRICE LIST

CLOCKWORK TRAIN SETS

M0 Passenger Set	6/-
M1 Passenger Set	7/6
M Goods Set	8/6
M2 Passenger Set	9/-
No. 0 Goods Set	15/-
No. 0 Passenger Set	15/-
No. 1 Goods Set	20/-
No. 1 Tank Goods Set	22/6
No. 1 Passenger Set	25/-
No. 1 Special Goods Set...	32/6
No. 1 Special Passenger Set	35/-
No. 2 Mixed Goods Set	40/-
Metropolitan Train Set C	55/-
No. 3C Train Set "Riviera Blue"	62/6
No. 2 Special Pullman Set	67/6
No. 3C Train Sets, "Flying Scotsman," "Royal Scot," "Cornish Riviera," or "Continental Express"	67/6

ELECTRIC TRAIN SETS

No. 3E Train Set "Riviera Blue" (6-volt) ...	80/-
No. 3E Train Sets (6-volt), "Flying Scotsman," "Royal Scot," "Cornish Riviera," or "Continental Express"	85/-
Metropolitan Train Set L.V. 6-volt)	95/-



No. 1 TANK GOODS SET

No. 1 SPECIAL PASSENGER SET

No. 1 SPECIAL GOODS SET

No. 2 MIXED GOODS SET

No. 2 SPECIAL PULLMAN SET

HORNBY TRAINS

BRITISH AND GUARANTEED

MANUFACTURED BY MECCANO LIMITED OLD SWAN LIVERPOOL

MECCANO

ENGINEERING FOR BOYS

The Meccano boy holds the secrets of the world's most wonderful engineering structures. He knows how they are built and he knows how they are worked because he builds actual models of them with his Meccano Outfit.

Each model he makes gives him the joy of achievement and he experiences that feeling of satisfaction that comes only after creating something with his own hands.

Meccano is real engineering in miniature—all the parts are miniatures of the corresponding parts in real engineering practice. They are all standardised and interchangeable and can be used to make hundreds of different models.

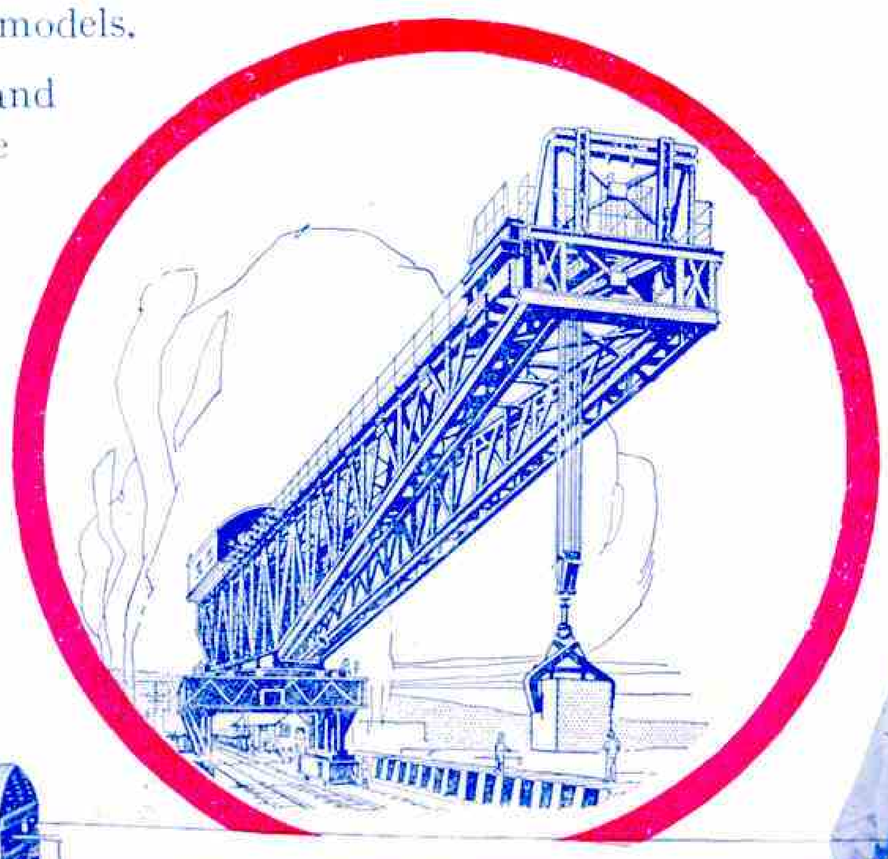
Meccano is the most thrilling and the most fascinating hobby in the world for boys.

COMPLETE OUTFITS

No. 000	2 -
No. 00	3 6
No. 0	5 -
No. 1	10 -
No. 2	16 -
No. 3	27 6
No. 4	52 6
No. 5 (Carton)	70 -
No. 5 (Wood Cabinet)	100 -
No. 6 (Carton)	125 -
No. 6 (Wood Cabinet)	155 -
No. 7 (Wood Cabinet)	450 -

ACCESSORY OUTFITS

No. 00A	1 6
No. 0A	5 6
No. 1A	7 -
No. 2A	12 6
No. 3A	26 -
No. 4A	17 6
No. 5A (Carton)	55 -
No. 5A (with No. 6 Outnt Cabinet	97 -
No. 6A (Wood Cabinet)	235 6



MECCANO LIMITED
OLD SWAN, LIVERPOOL

PUBLISHED BY MECCANO LTD., OLD SWAN, LIVERPOOL, ENGLAND
Printed by John Waddington Ltd., Leeds and London.